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Bibliography on Evapotranspiration (–1955)

0 September 1959 No. 9

METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

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MALCOLM RIGBY, Editor

Vol. 10 SEPTEMBER 1959 No. 9

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SPECIAL FEATURE IN THIS ISSUE

Bibliography on Evapotranspiration (–1955)

By
Geza Thuronyi

(For complete table of contents see back cover)

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LIST OF PERIODICALS

Note: This list contains the titles of the periodicals which regularly contain material on meteorology or related fields and it comprises only a small percentage of the periodicals from which pertinent articles are abstracted. The form of serial entry adopted by MAB is given in bold face type below.

PERIODICALS IN WHICH METEOROLOGICAL ARTICLES REGULARLY APPEAR

★**Acta Geophysica Polonica,** [Warsaw]
★Acta Meteorologica Sinica, [Peking].
Akademiia Nauk SSSR, Izvestiia, Ser. Geogr. and **Ser. Geofiz.,** [Moscow].
American Geophysical Union, Transactions, [Washington].
★**American Meteorological Society, Bulletin,** [Boston].
★**Angewandte Meteorologie,** [Potsdam].
Annales de Géophysique, Centre National de la Recherche Scientifique, [Paris].
★**Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A** and **Ser. B,** [Vienna].
Australian Journal of Physics, [Melbourne].
★**Australian Meteorological Magazine,** [Melbourne]
★Beiträge zur Physik der Atmosphäre, [Frankfurt a. Main].
★**Ciel et Terre,** Société Belge d'Astronomie, Météorologie et Physique du Globe, [Brussels]
★**Geofisica e Meteorologia,** Società Italiana di Geofisica, [Genoa]
Geofisica Pura e Applicata, Istituto Geofisico Italiano, [Milan].
★**Geophysical Magazine,** Japan Meteorological Agency, [Tokyo]
Hemel en Dampkring, [The Hague].
★**Időjárás,** Magyar Meteorológiai Társaság and Országos Meteorológiai Intézet, [Budapest].
★**Indian Journal of Meteorology and Geophysics,** [Delhi].
★**Journal de Mécanique et de Physique de l'Atmosphère,** Société Météorologique de France
★**Journal of Atmospheric and Terrestrial Physics,** [London].
Journal of Geophysical Research, [Washington].
★**Journal of Meteorological Research,** [Tokyo].
★**Journal of Meteorology,** American Meteorological Society, [Boston].
★**The Marine Observer,** Air Ministry, Meteorological Office, London.
★**The Meteorological Magazine,** Air Ministry, Meteorological Office, London
★**Meteorologické Zprávy** [Prague].
★**Meteorological Society of Japan, Journal,** [Tokyo].
★**La Météorologie,** Société Météorologique de France, [Paris].
★**Meteorologiia i Gidrologiia,** [Leningrad].
★**Meteorologische Rundschau,** [Berlin].
★**Monthly Weather Review,** U. S. Weather Bureau, Washington, D. C.
Polarforschung, Archiv für Polarforschung, [Kiel].
★**Przegląd Geofizyczny,** [Warsaw].
Revista de Geofísica, Instituto Nacional de Geofisica, [Madrid].
★**Rivista di Meteorologia Aeronautica,** Servizio Meteorologico, [Rome].
★**Royal Meteorological Society, Quarterly Journal,** [London].
★**South Africa, Weather Bureau, Notos,** [Pretoria].
★**Tellus,** Svenska Geofysiska Föreningen, Stockholm.
Vsesoiuznoe Geograficheskoe Obshchestvo, SSSR, Izvestiia, [Leningrad].
★**Weather,** Royal Meteorological Society, [London].
★**Weatherwise,** American Meteorological Society, [Boston].
★**Wetter und Leben,** Österreichische Gesellschaft für Meteorologie, [Vienna].
★**WMO Bulletin,** World Meteorological Organization, [Geneva].
★**Zeitschrift für Meteorologie,** Meteorologisches Observatorium, Potsdam.

★ Indicates those periodicals which are primarily meteorological.

FOREWORD

Meteorological Abstracts and Bibliography is a monthly publication whose purpose is to ring to the attention of meteorologists current literature in their field.

Part I contains abstracts of current literature in the fields of meteorology, etc.

Part II of each issue comprises an annotated bibliography of important references on a pecial subject (usually arranged chronologically).

Bibliographies published in the successive issues were:

Vol. I, 1950

. Atmos. Pollution	2. Aerobiology	3. Cloud Physics	4. Hail
. Tornadoes	6. Volcanic Dust	7. Climat. Changes	8. Thunderstorms
. Icing	10. Acoust. Propagation	11. Evaporation	

Vol. II, 1951

. Extended Forecast.	2. Long Range Forecast.	3. Soil Temp.	4. Constants, etc.
. Clim. of Near East	6. Clim. of Middle East	7. Special Winds	8. Radar Storm
. Condensation Trails	10. Clim. of N. E. Africa	11. Mountain Met.	Detect.

Vol. III, 1952

. Clim. of N. W. Africa	2. Carbon Dioxide	3. Clim. of Argentina, etc.	4. Dew
. Objective Forecast.	6. Stratus Forecast.	7. Urban Climatology	8. Clim. of C. Africa
. Visibility	10. Glaze and Rime	11. Free Air Turbulence	

Vol. IV, 1953

. Turbulence Theory	2. Turbulent Diffusion	3. Frost	4. Clim. of Australia, etc.
. High Level Winds	6. Winds in Stratosphere	7. Jet Stream	8. Radiation Bioclim.
. Clim. of Pacific	10. Auroras	11. Sferics	

Vol. V. 1954

. Oceanog. Met.	2. Clim. of S. E. Asia	3. Auroral Physics	4. Tropopause
. Balloons	6. Numerical Forecast.	7. Radiation Data	8. Vertical Motion
. Clim. of Arctic	10. Industrial Met.	11. Wind Waves and Swell	

Vol. VI, 1955

. Bibliog. of Bibliog.	2. Texts & Monogr. Bibliogs.		3. Storm Surges
. Ionospheric Prop.	5. Photochem.—Upper Atmos.		6. Cloud Physics
. Radar Cloud Physics	8–9. Atmos. Nuclei	10. Weather Modification	11. Cooling Power

Vol. VII, 1956

. Synoptic Met.-Arctic	2. Clim. of Enclosed Spaces	3. Cosmic Rays (–1952)
. Cosmic Rays (1953–56)	5. Atmos. Radioactivity	6. Inversions
. Snow Micromet.	8. Snow Micromet. (Suppl.)	9–11. Tropical Cyclones

Vol. VIII, 1957

Solar Weather Relations	2. Night Airglow	3. Forecasting Special Elements
Forest Micrometeorology	5. Hydromet. Forecasting	6. Numerical Forecast. (Suppl.)
Albedo 8. Meteors	9–10. Tropospheric Prop.	11. Medical Meteorology

Vol. IX, 1958

Radioastronomy	2. Solar Astrophysics	3. Radioactivity in Atmosphere
Waves and Currents	5. Physical Oceanog.	6. Dynamic & Phys. Oceanog.
Long Range Forecast.	8. Radar Met. 9. Cosmic Rays	10–11. Geomagnetism

Vol. X, 1959

Works of C. E. P. Brooks	2. Tornado Forecasting	3. Soil Moisture
Sferics	5–6. Ozone	7. Acoustic Waves
Evaporation Measurement	9. Evapotranspiration (–1955)	

Other bibliographies in preparation are:

Actinometers	*High Atmosphere Temperatures*	*Singularities*
Forecast Verification	*Micrometeorology*	*Synoptic Aerology*
Frost	*Radiation*	*Thunderstorms*

Part III contains a listing of reviews, translations, reprints, and the contents of important blications. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. The December issue nprises cumulative author, subject, geographical and journal indexes.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where the material may be found. The Union List of Serials (Gregory) is the source of most of the symbols used. In some cases, where no symbol has been assigned to a library, one will be devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DNLM:	U. S. National Library of Medicine, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.
GB-MO:	Great Britain, Meteorological Office Library, Harrow, England.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by charts

Geographic locations are in the English form rather than the form used locally, for example Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwise stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet according to the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months are abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Number (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus an entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau*, *Jahrgang* 2 (Vol. 2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

MAJOR GENERAL WORKS

COLLECTED WORKS

10.9–1 551.5(03)

Glossary of meteorology, ed. by Ralph E. Huschke. Sponsored by U. S. Dept. of Commerce, Weather Bureau; U. S. Air Force Air Weather Service MATS and Geophysics Research Directorate; U. S. Army Signal Corps and U. S. Navy Office of Naval Research. Boston, American Meteorological Society, **1959.** 638 p. **DWB**—The long-awaited English (or American) **Glossary of meteorology** is now available for the nominal cost of $12. The last such compilation was issued by the U. S. Weather Bureau in 1946, based on a 40 years accumulation of definitions by CHARLES F. TALMAN, edited posthumously by MAJOR THIESSEN and JAMES K. MCGUIRE (who also worked on the present glossary during the period of its inception in 1952–53). The present glossary, comprising >7000 terms and their definitions, was undertaken by the American Meteorological Society with support from the U.S.W.B. and Department of Defense. The definitions were prepared by experts for broad subject areas such as dynamic meteorology, physical meteorology, climatology, statistics, etc., with the main effort being made by the late C. E. P. BROOKS, JAMES E. MCDONALD and MORTON G. WURTELE, and revision or definition of smaller areas by 40 or more contributors (C. F. BROOKS, H. E. LANDSBERG, ARNOLD COURT, HERBERT RIEHL, H. V. SVERDRUP, DAVE FULTZ, to name only a few). The overall editing was done by RALPH E. HUSCHKE, with help from many others who are mentioned in the acknowledgments. The project was guided by R. N. CULNAN of the U. S. W. B., R. G. STONE of the U. S. A. W. S., Mrs. F. L. WHEDON of the Signal Corps and J. H. HUGHES of O. W. R. The stupendous task of administrative supervision was in the able hands of KENNETH C. SPENGLER, Executive Secretary of the American Meteorology Society. The vast majority of the definitions are original in this edition, sources are freely cited, cross-references profusely indicated, synonyms, abbreviations and symbols placed in parenthesis before the definition, dual definitions given in order of relative importance or usage, most terms given in straight-forward (not inverted) style, in singular number and as nouns or noun phrases. Many borderline terms in physics, radio technology, statistics, astrophysics, oceanography, hydrology, etc. are included, but the bulk of the glossary is confined to purely meteorological terms. A number of obsolete terms are included but are so indicated. A considerable number of terms relating to special winds in all parts of the earth are also included. A few equations have been incorporated for the purpose of specificity but not to replace clear verbal definition. Illustrations were not included because of the prohibitive cost, time and volume factors inherent in such presentation. Perhaps another edition (in 10 or 15 years) could be partially illustrated. On the other hand, the verbal definitions are often quite comprehensive, for instance under *Standard Atmosphere*, specifications are given of 8 or 9 parameters for each of the two current atmospheres: 1) the ICAO (1952) standard atmosphere, and 2) the ARDC (1956) model atmosphere, which extended the ICAO atmosphere to 500 km, and 4 other definitions of the term for special purposes. Terms and cross-references are given in easy-to-read bold face type. The format is handy and the binding adequate but not ornate. *Subject Headings:* **1. Glossary of meteorology 2. Meteorological glossaries. I. Huschke, Ralph E.** (*ed.*) **II. Brooks, C. E. P. III. McDonald, James E. IV. Wurtele, Morton G.**—*M.R.*

10.9–2 613.693:629.19

U. S. School of Aviation Medicine, Randolph Field, Texas, **Epitome of space medicine.** 41 articles, including reprints of articles published 1950–1957. Loose-leaf. Each article with original paging.—The articles on space medicine reprinted in this volume include reports on

effects of decompression, survival, weightlessness, psychology, day-night cycle, radiation, and on planetary atmospheres, life on Mars, etc. For listing of pertinent articles, *see* Pt. III, p. 920, July 1958, *MAB*. These articles abstracted separately. *Subject Headings:* **1. Space medicine 2. Planetary atmospheres 3. Life on Mars 4. Mars.**—*M.R.*

10.9–3 551.509.313:061.3(08)

*†§Deutsche Meteorologische Gesellschaft, **Symposium über Numerische Wettervorhersage in Frankfurt a.M., vom 23. bis 28. Mai 1956.** [Symposium on numerical weather forecasting held Frankfurt a.M., May 23–28, 1956.] *Germany. Deutscher Wetterdienst, Berichte*, 5(38), **1957.** 97 p. figs., tables, refs., eqs. For listing of contents *see* Pt. III, p. 1036, Aug. 1958, *MAB*. Most articles abstracted separately. **DWB, DLC**—Some twenty papers delivered at the Frankfurt a.M. symposium on numerical forecasting are given, either in their entirety or in summary form. This collection of papers represents an excellent review of present knowledge in this new field of meteorology. It gives a complete idea of the modern techniques used in numerical prediction, and of the theoretical and practical aspects of this new promising method of forecasting. *Subject Heading:* **1. Numerical forecasting symposia.**—*A.V.*

10.9–4 551.5(08)

Angola. Serviço Meteorológico, **Miscelanea geofísica publicada pelo Serviço Meteorológico de Angola em comemoração do X aniversario do Serviço Meteorológico Nacional.** [Geophysical Miscellany, published by the Meteorological Service of Angola in commemoration of its 10th anniversary.] Luanda, **1956.** 366 p. figs., tables, refs. For listing of contents, *see* Pt. III, p. 1316, Oct. 1958, *MAB*. All articles abstracted separately. **DWB** (M(08) R592mi). Review by O. Bultrini in *Rivista di Meteorologia Aeronautica*, Rome, 18(3):72, July /Sept. **1958.** *Subject Headings:* **1. Meteorology 2. Collected works.**

10.9–5 551.5(08)

Meteorological Society of Japan, Tokyo, **Tenki (Weather), the 75th Anniversary Volume.** Issued Nov. **1957.** 167 p. figs., tables, refs. Entirely in Japanese. Tables of contents in Japanese and in English, preceding p. 1. This special volume was issued in honor of the 75th anniversary of the first Journal of the Society, concurrently with a similar English language commemorative volume of its Journal (different collection of articles in each anniversary volume). For listing of articles in the Tenki anniversary volume, *see* Pt. III, p. 478, March 1959, *MAB*. For listing of contents of the English language anniversary volume of the Journal, *see* Pt. III, p. 1041, Aug. 1958, *MAB*. *Subject Headings:* **1. Meteorology 2. Collected works.**

TEXTBOOKS

10.9–6 551.5(02)

Byers, Horace Robert (*Chicago Univ.*), **General meteorology.** 3rd ed. N. Y., McGraw-Hill, **1959.** 540 p. numerous figs., foot-refs., eqs. **DLC** (QC861.B9). First ed. published **1937** with title, **Synoptic and aeronautical meteorology.** Second ed. with title, **General Meteorology,** pub. **1944.** (For abstract on this latter ed., *see* D–49, 4B–330, 5H–23, *MAB*.)—Although this edition of Byers' universally-known text for mature students of meteorology is no larger than the 1944 edition, all except the first two chapters have been completely rewritten and many new illustrations added to incorporate the vast body of new or more refined knowledge that has accrued since World War II. Recent discoveries regarding the radiation balance, the jet stream, constant-level balloons, reconnaissance planes, rockets, satellites, vorticity, thunderstorm and hurricane structure and forecasting, radar cloud, weather and storm studies and tracking, tornado research, Northern Hemisphere charts, cloud physics and artificial rain production, ice-fog, smog and pollution problems, radioactive tracers, knowledge of the structure of the high atmosphere, the ionosphere, numerical forecasting by graphical or electronic techniques (computers), objective fog and severe storm forecasting, use of constant-pressure charts instead of constant-level charts, new data on energy-exchange from the sea-atmosphere and on heat and momentum transport in the atmosphere, etc. are all new subjects or subjects on which the emphasis has been changed: in many cases by cutting down on the amount of applied material (e.g., temperature, frost and precipitation forecasting, ha

of the material on turbulence, and the 23 pages of appended material on international weather codes, etc.) in order to keep the emphasis on fundamentals. Mention is made that these and numerous other applications should be the subject of another book. Even the details of cloud seeding and artificial fog dissipation have been only briefly mentioned, while giving due emphasis to the fundamental principles involved in the discovery of nucleation by ice, silver iodide and water. In reorganizing the book, several chapters have been added or existing chapters divided: for instance, Ch. 8 (Water vapor and thermodynamic effects) was previously part of Ch. 7 (Thermodynamics and statics), and Ch. 10, on **Characteristics of fluid flow applied to the atmosphere** in the present edition is entirely new, though some of the principles were touched on in the older edition. The chapters (11–14) on air masses, fronts and cyclones have been completely rearranged, omitting the greater part of 40 pages of material on air masses of N. America and Europe, and expanding on the material on the vertical structure of cyclones and anticyclones (Ch. 12), the development and life cycle of cyclones (Ch. 13), and the structure of air masses (Ch. 14). Ch. 16, on **Tropical meteorology,** is brand new, replacing the old Ch. 18 on **Tropical cyclones** which gave much less material on easterly waves, zones of convergence, vertical structure, wind fields, and rain bands as shown on radar. Ch. 20 on **Fog** has been condensed, but the thoroughness of that Chapter (21) in the old book has not been sacrificed in the least. Ch. 22 in the 1944 ed. (formation of ice on aircraft) has been completely liquidated and the chapter on **Thunderstorms and related phenomena** (Ch. 23 in old, 19 in new) shortened and brought up to date by inclusion of basic ideas gained from the "Thunderstorm Project," omitting material on thunderstorm forecasting and adding new knowledge of tornado theory and structure. The final chapter, on **Turbulence** (21), is only half as long but much more fundamental than Ch. 24 in the 1944 ed., though some of the material on wind structure has been transferred to the new Ch. 10 on **Fluid flow.** All in all, this new textbook is a welcome addition to the reference and teaching literature of lasting value. *Subject Heading:* **1. Meteorology textbooks.**—*M.R.*

10.9–7 551.5:63(02)

†Ventskevich, Georgiĭ Zenonovich, **Agrometeorologiia.** [Agrometeorology.] Leningrad, Gidrometeoizdat, **1958.** 376 p. 90 figs., 58 tables, bibliog. p. 374–376. **DWB** (M:63 V467ag) (5000 copies)—A new and original textbook on agrometeorology for hydrometeorological technologists or agricultural students, or workers at the college level. A chapter on the climate of fields goes into the soil climate (heat regime), microclimate, phytoclimate, and control of the microclimate. The second chapter takes up the various meteorological elements: radiation and light, temperature of air and soil, precipitation, snow cover and wind. Soil moisture and moisture conservation of plants, water balance, evaporation, transpiration, etc., constitute the 3rd ch. and the relation of weather to various specific crops (grain, tobacco, root crops, fruits) and diseases of plants or pests in Ch. 4. Types of weather which are unfavorable for crops (freezes, drought and dry winds, lack of snow in winter, etc.) are the subject of Ch. 5. Agrometeorological observations (networks and their establishment, temperature, humidity of air and soil, phenology, shelter-belt observations, seasonal migration of cattle and sheep, compilation of data and telegraphing of observations and inspection) are discussed in Ch. 6. Public agrometeorological service organization, decadal bulletins, analysis of conditions, forecasts, special service to collectives, etc., preparation of yearbooks, agroclimatic regional studies for long periods, Ch. 7 and, finally, problems and methods of agroclimatic research, agroclimatic regionalization, microclimatic surveys of characteristics of regions, and agroclimatic handbooks and their use, Ch. 8. Many examples of analytical tables, diagrams, charts, bulletins, etc. are included in text. *Subject Headings:* **1. Agrometeorological textbooks 2. U.S.S.R.** —*M.R.*

10.9–8 551.511.6(02):533.15

†Mises, Richard von, 1883–1953, **Mathematical theory of compressible fluid flow.** Completed by Hilda Geiringer and G. S. S. Ludford. N. Y., Academic Press, **1958.** 514 p. 175 figs., 6 tables, bibliog. p. 502–503, eqs. Notes and addenda, p. 464–501, contain many bibliog. refs. (*Applied Mathematics and Mechanics,* Vol. 3.) **DWB** (533.6 M678ma), **DLC** (QA930.M57)—A thorough theoretical and practical textbook on fluid flow as applied to

aerodynamics: 1) basic equations, 2) energy equation, Bernoulli equation, 3) viscosity and conduction, 4) acoustics and the wave equation, 5) subsonic and supersonic motion, Mach numbers, 6) general vortex theory of HELMHOLTZ and KELVIN, 7) irrotational motion, 8) steady flow, 9) theory of characteristics, 10) characteristics in case of two independent variables, 11) steady flow with viscosity and heat conduction, 12) nonsteady flow of an ideal fluid, 13) simple waves; theory of 14–15) shock phenomena and plane steady potential flow, 16) basic relations, 17) hodograph method, 18) simple waves, 19) limit lines and branch lines, 20) CHAPLYGINA'S hodograph method; integration theory and shocks, 21) development of CHAPLYGINA'S theory, 22) shock theory, 23) examples of shocks, 24) nonisotropic flow and 25) transonic flow. Author and subject indexes are provided. *Subject Headings:* **1. Fluid flow textbooks 2. Aerodynamics theory 3. Turbulence theory 4. Acoustical theory. I. Geiringer, Hilda II. Ludford, G. S. S.**—*M.R.*

10.9–9 551.511:521(02)

†*Rakipova, Larisa Rakipovna, **Teplovoĭ rezhim atmosfery.** [Thermal regime of the atmosphere.] Leningrad, Gidrometeoizdat, **1957.** 162 p. 38 figs., 61 tables, 85 refs., 24 eqs. **DWB** (M11 R162te)—A monograph—(1700 copies) which could be used as a textbook for physicists, meteorologists, climatologists, geography students, engineers and professional workers interested in the thermodynamics of the atmosphere. The 3 main chapters cover: I—basic problems of the thermal regime of the stratosphere, the temperature distribution in the troposphere, and climatic investigations on the heat balance and albedo of the earth; II—zonal temperature field and heat regime and its calculation; III—advective heat exchange in the atmosphere, horizontal turbulent exchange (grossaustausch). The book contains a great deal of well organized tabular and graphic data on the various elements of the heat balance at all levels to 16 km in the U.S.S.R., the Northern Hemisphere and the earth, based on both observation and theory. *Subject Headings:* **1. Thermodynamics of the atmosphere 2. Radiation balance of the earth 3. Thermodynamic meteorology textbooks 4. Dynamic climatology 5. Albedo of earth 6. World.**—*M.R.*

10.9–10 523.755(02)

†Shklovskiĭ, I. S., **Solnechnaia korona.** [Sun's corona.] Moscow, Gosud. Izdatvo Tekhniko-Teoreticheskoĭ Literatury, **1951.** 387 p. 47 tables, 60 figs., 182 refs., eqs. **DLC** (QB529.S5)—A substantial book reviewing the current knowledge of the solar corona including results of photometric research, spectral lines and their interpretation, qualitative chemical analysis of gases and structure of the corona, problems of ionization of various elements (hydrogen, iron, nickel), ultraviolet radiation from the corona, and its influence on the earth's atmosphere (Ch. 5), radio radiation from the sun (Ch. VI) and, finally, the theory of the solar corona. The literature cited includes some as recent as 1950, and is well-balanced between native and foreign sources. Illustrative material and theory are sufficiently technical for the advanced student. *Subject Headings:* **1. Sun's corona textbooks 2. Solar-terrestrial relationships 3. Solar radio radiation.**—*M.R.*

10.9–11 551.515.2(02)

§Arakawa, Hidetoshi, **Taifu.** [Typhoon.] Pub. in Japan, **1958.** 203 p. 79 figs. 2 plates, port., 6 p. of index. In Japanese.—A small (pocket size) book covering all of the important aspects of typhoons: observation, structure, climatology, forecasting, reconnaissance, radar tracking, case histories, rainfall, tides or floods, damage and theory. Schematic diagrams, charts and photographs are all up-to-date, including treatment and illustration of the latest numerical weather prediction equipment and techniques. Historical material is not neglected. *Subject Headings:* **1. Typhoon textbooks 2. Japanese language textbooks.**—*M.R.*

10.9–12 551.510.535:621.39

Dolukhanov, M. P., **Rasprostranenie radiovoln.** [Radiowave propagation.] Moscow, Gosud. Izdatvo Literatury po Voprosam Sviazi i Radio, **1952.** 490 p. refs., numerous figs., tables, and eqs. **DLC** (QC661.D6)—A textbook on radio propagation, going quite extensively into surface propagation, ionospheric propagation (p. 145–245), long wave, short wave, and

ultrashort wave propagation and, finally, atmospherics and cosmic noise. Tropospheric meteorological factors are discussed on p. 436–461, in the chapter on ultrashort wave propagation. Theory, curves, etc. are given for humidity and temperature effects, channels and turbulent dispersion, absorption and beyond-the-horizon propagation. *Subject Headings:* **1. Radio wave propagation textbooks 2. Ionospheric radio wave propagation 3. Tropospheric radio wave propagation.**—*M. R.*

10.9–13 551.4(02)

†Briault, E. W. H. and Hubbard, J. H., **Introduction to advanced geography.** London, Longmans, Green, **1957.** 470 p. 221 figs., numerous tables, refs. at end of each ch. **DWB** (910 B849in)—Ch. 18 on the weather, goes into meteorological observations, pressure, wind, weather, temperature, visibility, clouds, sunshine, rainfall, synoptic charts, moving pressure systems, examples of synoptic types, thunderstorms and forecasting. Ch. 19, on world distribution of climatic elements, deals with general circulation, local winds, world temperature regions, rainfall types; and Ch. 20, on classification of climates, describes and illustrates AUSTIN MILLER'S, KÖPPEN'S and THORNTHWAITE'S classifications of climate. Climatic accidents (glaciation and arid landscapes), volcanic accidents, soils, lakes and oceans, provide subject matter for other illustrative chapters in this text on advanced geography. *Subject Headings:* **1. Physical geography textbooks 2. Climatology.**—*M. R.*

10.9–14 551.5:656.61(02)

§*†Gładysz, Bronisław, **Meteorologia dla zeglugi morskiej.** [Meteorology for sea navigation.] 1st ed. Gdynia, Wydawnictwo Morskie, **1957.** 496 p. 290 figs. (incl. charts, some fold.), numerous tables, 46 refs. English-Polish and German-Polish glossaries, p. 481–489. **DLC** (QC861.G55)—A large and fairly comprehensive textbook on marine meteorology, comprising 31 chapters divided into 4 main parts: I. General meteorology; II. Synoptic meteorology; III. Climate of the oceans; and IV. Hurricanes and their avoidance. The appendix gives the (1955) International Meteorological Code, the Baltic Ice Code, monthly data tables for 150 world seaports, and an English-Polish and German-Polish glossary of synoptic and marine meteorological terms. The book is well illustrated with schematic drawings and color charts of world wind currents and other elements of interest to mariners, as well as typical synoptic charts. The 100 pages on hurricanes constitute in itself an elementary text on tropical storms of all parts of the world. *Subject Headings:* **1. Marine meteorology textbooks 2. Tropical cyclones 3. Polish language textbooks.**—*M. R.*

10.9–15 551.509.2/3(02)

†Genemon, Nōzawa (*Prof. Maritime Safety Academy*), **Weather charts and meteorological phenomena.** Tokyo, Seizandō Shoten, Aug. **1958.** 221 p. figs., tables throughout. refs. at end of each chap. In Japanese (title Romanized: **Tenkizu To Kisho**). **DWB** (M G326te)—A textbook entirely in Japanese, with many examples of charts, tables, codes, etc. on elementary meteorology and synoptic analysis, taking up air masses, fronts, stability and instability, cyclones, hurricanes, squalls, fog, clouds, turbulence, precip., snow, hail, map analysis, general circulation, trade winds, sea breezes, blocking, etc. A glossary is found on p. 203–214. *Subject Heading:* **1. Synoptic meteorology textbooks.**—*M. R.*

10.9–16 551.5:52 52(02)

Höfling, Oskar, **Wetterkunde und Astronomie. Sonderdruck aus des Verfassers "Lehrbuch der Physik," Mittelstufe, Ausgabe A.** [Meteorology and astronomy. Reprint from Höfling's "Lehrbuch der Physik."] Bonn, F. Dümmler, **1955.** 47 p. 32 figs. **DWB** M:520 H712we)—In Pt. I there is a simple exposition of the basic ideas of meteorology: atmosphere, weather, air masses, pressure, temperature, humidity, wind, cloud, precipitation, and synoptic weather maps and phenomena, and finally extra terrestrial influences. Pt. II covers basic ideas of astronomy, the solar system; sun, planets, earth and moon and stars and galaxies. Excellent schematic illustrations are included along with a few good photographs and synoptic charts. *Subject Headings:* **1. Meteorology for astronomers 2. Astronomy textbooks.**—*M. R.*

MONOGRAPHS AND COMPREHENSIVE PAPERS

See also: **WMO Comm. for Instruments and Methods of Obs.**, 10.9–50; **WMO Comm. for Synoptic Met.**, 10.9–51; **Severnyĭ Polius Exped., 1954–55, Arctic** (Iatsun), 10.9–54; **Data summaries, Greenland**, 10.9–56; **Glacial morphology, S. Sweden** (Johnsson), 10.9–94; **Satellite observatory orbits** (Nielsen), 10.9–106; **Climate, Loire-Gironde region** (Garenc), 10.9–288.

10.9–17 551.5(06)

U. S. Army Electronic Proving Ground, Fort Huachuca, Arizona, **Signal Corps operational meteorological support to U. S. Army Research and Development activities during fiscal year 1957.** Nov. **1957.** 52 p. 15 photos. (USAEPG-SIG 970-7) **DWB** (M(06) U581si)—Signal Corps personnel were assigned to the task of supplying meteorological support for all U. S. Army missions in 1951. In 1957, nine offpost meteorological teams, comprising as many as 24 officers and 219 enlisted men (plus 3 civilians), operated at Gila Bend and Yuma, Ariz.; Fort Amador, Canal Zone; Dugway, Utah; Fort Greely, Alaska; Fort Monmouth, N. J.; Natick, Mass. and on the Greenland Ice Cap near Thule. These teams were engaged in instrument, radio meteorology, glacial operations, electronics, missile, tropical, Arctic, clothing and chemical warfare operations or support. Besides a description of the activities of these teams, the various supporting activities of the Chemical Corps, Corps of Engineers, Ordnance Corps, Quartermaster Corps, Signal Corps, Medical and Transportation Corps are reviewed. Work proposed for 1958 is outlined. Micrometeorological, instrumental and forecasting work is involved, ranging from observational work in the field, to developmental and research work in the laboratory. Other stations will be opened in fiscal year 1958. *Subject Headings:* **1. U. S. Signal Corps meteorological activities 2. U. S. Army meteorological research 3. Micrometeorological research teams 4. Fort Huachuca, Ariz.**—*M.R.*

10.9–18 551.506.7(265)

*U. S. Joint Task Force Seven, **Meteorological Report on Operation Hardtack,** Vol. 1, March **1958,** Vol. 2, April **1958** and Vol. 3, May, **1958.** 144, 365 and 373 p. All entirely tables. "This report being prepared in 6 vol. Vol. 1–5 contain observational data, March–July 1958 from selected stations. Vol. 6 contains all upper air (RAOB) data for same period." (JTFMC TP-8)—A series of 5 volumes giving *in extenso* meteorological data obtained from surface, upper air wind and aircraft reconnaissance observations in March–July, 1958, respectively (1 Vol. per month) during "Operation Hardtack" atomic tests at Eniwetok Proving Grounds. A sixth volume will give (RAOB) data obtained at selected stations in the area during the period. Reports are compiled from punch card decks prepared in the area for U. S. N. Ships and for land stations at Bikini, Kwajalein, Eniwetok, Wake, Utirik, Nauru, Kaping, Majuro, Truk and Ponape. Similar computation was made for Operation Redwing in 1956. *Subject Headings:* **1. Operation Hardtack (1958) 2. Upper air observational data 3. Surface observational data 4. West Central Pacific 5. Eniwetok. I. Luedecke, A. R. II. Rex Daniel F.**—*M.R.*

10.9–19 551.582.2(796

*De Marrais, G. A., **The engineering climatology of the National Reactor Testing Station** *U. S. Atomic Energy Commission, IDO,* No. 12004, Nov. **1958.** 77 p. 19 figs., 30 tables 5 refs. **DWB** (M82.2/796 U587en)—Climatological analyses based on 7–8 yrs of data a National Reactor Testing Station (NRTS) in southeast Idaho are presented and discussed. The site is 34 mi by 29 mi and is located at 5000 ft elevation with mountains 9000–11,000 high surrounding the Snake River Plain. Two main stations and at least 4 auxiliary stations (maximum of 19 stations) and 2 mobile units for special occasions have been operating at a times since 1949. Temp., humidity, precip., winds, state of ground and dust are elements treated. Normals, ranges, isopleths of minimum temp. for site and vicinity, inversion fre quencies and durations, frequencies of specified temps., degree-days, freeze-thaw cycles, soil temps. (surface and to 7 ft depth), relative humidity, wet bulb temp., isohyets for regio snow depth and frequency, icing, hail, thunder, winds, wind roses at 20, 150 and 250 ft lev maximum winds, frequency of state of ground, dust analysis and particle size distributio height and lapse rate variation, cooling power climatology, etc. are discussed and illustrat

with charts, nomograms, graphs and tables. *Subject Headings:* **1. Climate of National Reactor Testing Station (NRTS), Southeast Idaho 2. Soil temperature data 3. Dust data 4. Southeast Idaho.**—*M.R.*

10.9–20 551.582.1(746) 551.588.2(746)

*U. S. Weather Bureau, **A meteorological survey of the CANEL site at Middletown, Connecticut, prepared by Weather Bureau Office, Middletown, Connecticut. 1958.** 28 p. 52 figs. (incl. map, photos.). 13 tables, 13 refs. Mimeo. **DWB** (M82.1/746 U587me C.2)—A detailed study of the climate of the area proposed for the Atomic Energy Installation (CANEL site), using data for Hartford, Conn. (Brainard Field) for April 1956–March 1958. The general climatology of the area is analyzed in terms of air masses, cloudiness, visibility, thunderstorms, precipitation, temperature, wet bulb, and surface winds. Then the "diffusion climatology" is considered; lapse rates or inversion probability and duration, wind flow, diurnal variations, diffusion coefficients, smoke plume studies, etc. The study is based on >25,000 observations. Conclusion is that surface winds are reduced by hills and channeled by minor variations in terrain. Extensive graphical presentations are included in supplementary section: wind roses, frequency graphs, histograms, charts, curves and photographs, as well as tabular data in text. *Subject Headings:* **1. Climate of Middletown, Conn. 2. Diffusion climatology 3. Microclimatology 4. Topoclimatology 5. Atomic energy plant surveys 6. Middletown, Conn.**—*M.R.*

10.9–21 551.579.4(76) 551.577

*Kutschenreuter, Paul H. (*Forecasting Services, U. S. W. B., Wash., D. C.*), **Rainfall and floods of April, May and June 1957 in the South-Central States.** *U. S. Weather Bureau, Technical Paper,* No. 33, March **1958.** 350 p. figs., tables, refs. **DWB**—A major monographic report on the various aspects of the flood-rains of early 1957. Pt. I takes up the relation to the main circulation <5,000 ft; 5–20,000 ft and 30–40,000 ft; Pt. II, the relation of the heavy rainfall centers to surface pressure features for 4 cases (April 26–28, May 12–13, 15–16, and May 20, 1957); Pt. III, the use of radar in flood detection; Pt. IV, the floods, forecasts and warnings and damage; Pt. V, the basic precipitation data for Arkansas, Kansas, northern Oklahoma and Texas. Daily and hourly precipitation data are given for April, May and June. Scores of photographs, maps, isohyetal and synoptic charts, and diagrams illustrate the various cases. *Subject Headings:* **1. Flood rainfall reports 2. Floods, Great Plains (Spring 1957) 3. Great Plains.**—*M.R.*

10.9–22 526

†Hirvonen, R. A. (*Inst. of Technology, Helsinki, Finland*), **The size and shape of the earth.** *Advances in Geophysics,* N. Y., Vol. 5:93–115, **1958.** 4 figs., 10 refs., eqs. **DWB, DLC**—A review of the scientific aspects of geodesy, triangulation, astronomical fixations, spirit leveling and gravity measurements, and finally, difficulties and new ideas in measuring the shape of the earth. *Subject Headings:* **1. Geodesy 2. Astronomical fixations 3. Gravity measurement 4. Triangulation 5. Advances in geodesy.**—*M.R.*

10.9–23 551.509.616 551.574.1

†World Meteorological Organization. Commission for Aerology, **Artificial control of clouds and hydrometeors.** Report of working group, prepared by L. Dufour, Ferguson Hall, F. H. Ludlam (chairman) and E. J. Smith. *World Meteorological Organization, WMO (Publication),* No. 50. TP. 19; Technical Note, No. 13, **1955.** 76 p. refs. French, Russian and Spanish summaries p. VII–XII. **DWB** (M(06) W927p). **Artificial control of clouds and hydrometeors.** *World Meteorological Organization, WMO Bulletin,* 8(3):140–144, July **1959.** 18 refs.—The authors of this report review the present state of knowledge concerning artificial modification of the structure and development of clouds and hydrometeors, with a view to evaluating the results of experiments made in various parts of the world. Pt. 1 is a general summary of cloud physics with particular attention to the processes of precipitation formation. In Pt. 2 the small-scale cloud modification experiments are described (orographic clouds, individual clouds, fog dispersal). Pt. 3 takes up large-scale weather modification experiments; the authors find that the question of large-scale effects cannot be answered satisfactorily after

ten years of intensive cloud seeding, because operations were aimed at obtaining results rather than information. Pt. 4 contains the authors' conclusions to the effect that cloud seedings from airplanes have almost certainly produced results, that no marked increase in precipitation has been achieved so far and that several years of basic research and carefully prepared and analyzed experiments will be necessary in order to evaluate with certainty the economic potential of cloud seeding operations. Plans to revise *WMO Technical Note* No. 13 in the light of recent advances in cloud seeding and weather control are detailed, along with comments on these advances, in **Artificial control of clouds and hydrometeors,** *WMO Bulletin,* 8(3):140–144, July **1959.** 18 refs. *Subject Headings:* **1. Artificial cloud modification 2. Cloud physics 3. Cloud seeding. I. Dufour, L. II. Hall, W. Ferguson III. Ludlam, F. H. IV. Smith, E. J.** —*G.T.*

10.9–24 551.586:61(98)

*†Danishevskiĭ, G. M., **Akklimatizatsiia cheloveka na Severe (s ocherkom kraevoĭ patologii i gigieny).** [Acclimatization of man in the North (with an outline of regional pathology and hygiene).] Moscow, Gosud. Izdatvo Meditsinskoĭ Literatury, **1955.** 356 p. 29 figs., 41 tables, bibliog. p. 347–353. **DLC** (RC958.R9D3). Review by B. B. Koĭranskiĭ in **Gigiena i Sanitariia,** Moscow, 22(8):89–90, Aug. **1957. DLC**—This unique textbook (1500 copies) is the first to be devoted to problems of medical climatology of the Soviet Arctic. The book reviews systematically in the 4 main parts, current knowledge of medical climatology, physical-geographic peculiarities of the Pechora region of the Arctic and sub-Arctic U.S.S.R., the question of acclimatization and Arctic pathology and problems of hygiene in the extreme northern regions. Of the 25 chapters, 4 deal especially with climatic rather than physiological aspects. Ch. 1 deals with the general concepts of climate, medical climatology, physiological indications of climatic influence, climatic types, climate and weather and microclimate. Ch. 2 deals with the facts and mechanisms whereby meteorological factors influence man. Ch. 3 discusses climate and pathology, and Ch. 4 the climatic characteristics of the Subarctic and extreme northern Pechora (temperature, pressure, humidity, wind, precipitation and snow cover and auroras). Flora, fauna, marine life, role of vitamins, processes of acclimatization of man in the Arctic and efficiency of health resort are taken up in subsequent chapters. Statistical clinical data is limited. *Subject Headings:* **1. Physiological climatology, Arctic 2. Medical meteorology, Arctic 3. Arctic bioclimatology 4. Pechora Region, U.S.S.R. 5. Soviet Arctic.**—*M.R.*

10.9–25 551.547.2:551.501.3

Harrison, Louis P., **Addendum to "Report on the problem of reduction of pressure."** Submitted Sept. 1, **1958** . . . to the Working group on "Pressure-Reduction Methods" of the Commission for Synoptic Meteorology, World Meteorological Organization. 42 p. eqs. "Original Report submitted by Harrison to the WMO Commission for Instruments and Methods of Observation (CIMO-II), Paris, June 1957, relating to the problem of reduction of pressure." **DWB** (M(07) W927 cm CIMO:1957)—An attempt to resolve the differences arising from current methods of reducing pressure to sea level (in millibars) at mountain or plateau stations and the methods used in aerological soundings where data are reduced to the height of some standard geopotential surface such as 850 mb, 700 mb, etc. The solution involves use of scalar and vector point functions involving use of geopotential units similar to those appearing on upper level charts. *Subject Headings:* **1. Pressure reduction to sea level 2. Geopotential units for pressure reduction.**—*M.R.*

10.9–26 551.587(47

Leningrad. Nauchno-Issledovatel'skiĭ Institut Aeroklimatologii, Trudy, No. 3, **Voprosy aeroklimatologii.** [Problems in aeroclimatology.] pub. **1957.** 80 p. **DWB**—The present monograph contains four thoroughly elaborated articles on aerological climatology, using data from over 4000 ascents during the post-war decade, made at many points in the Ukraine, Sevastopol, Odessa, Rostov, Kiev, Poltava and Kursk, in the first article by L. M. Kravtsova on upper air temperatures in the Ukraine from stations in the Far East; in the article by Z. Gavrilova on the Far Eastern monsoon, from Murmansk, Kharkov, Smolensk, Kuibyshev and Saratov; in the article by I. P. Polovina on the accuracy of upper air specific humidity, and

from Odessa in the article by M. B. BELEN'KIĬ on the analysis of variance of upper air climatological statistics. For listing of contents, *see* Pt. III, p. 476, March 1959, *MAB*. All articles abstracted separately. *Subject Headings:* **1. Upper air climatology, Ukraine 2. Specific humidity over U.S.S.R. 3. U.S.S.R. I. Evseev, P. K.** (*ed.*).—*M.R.*

POPULAR METEOROLOGY

See also: **Weather and aircraft accidents** (Stewart), 10.9–111.

10.9–27 551.507.362.2

Caidin, Martin, **Vanguard! the story of America's scientific satellite program.** N. Y., Dutton, **1957.** 288 p. figs., photos. **DWB** (629.1388 C133fa)—A popular technical book describing the U. S. earth satellite program (Project Vanguard), and the launching facilities, tracking station and equipment, the launching techniques, the atmosphere and its structure, meteors, auroras, the V-2, aerobee, atlas and the several stage components of the Vanguard, each described and illustrated with excellent photos and drawings in separate chapters. *Subject Headings:* **1. Project Vanguard 2. Rocket development 3. Earth's atmosphere.**—*M.R.*

10.9–28 551.5:551.576.11(023)

Scorer, R. S., **Weather.** London, Phoenix House; New York, Roy Publishers, **1959,** 63 p. 35 figs. (*Progress of Science Series*, ed. by Nigel Calder.) **DLC** (QC863.S4)—A small. but nicely printed and well-bound, book covering the basic principles of meteorology: the atmosphere, thermals and clouds, ice and thunderstorms, winds, rotation of earth and its effects, pressure and vorticity, circulation, energy of wind and storms, cyclones, severe storms and, finally, careers in meteorology in the U. K. and U. S. The emphasis throughout the book on clouds and storms reflects the author's interest in clouds and convection, hence most of the (excellent) photographic plates are concerned with cloud formations, storms or with other connective phenomena of interest to aviation. *Subject Headings:* **1. Popular meteorology books 2. Convective clouds 3. Thermals.**—*M.R.*

10.9–29 523.4:629.19

Gatland, Kenneth W., **Project satellite.** New York, British Book Centre, **1958.** Illustrated with photos and drawings by John W. Wood. 169 p. table. **DWB** (629.1388 G261PR)—Each of the four chapters of this popular book on rockets, satellites and interplanetary travel is written by a different author. WERNHER VON BRAUN recounts the history of rocketry from 1928–1945, especially in Germany. KENNETH GATLAND takes up the British and American work on artificial satellites up to the time of the first and second Sputniks. HARRY E. ROSS gives engineering data and concepts of space stations or orbital bases; and A. V. CLEAVER projects the ideas into the future to interplanetary flight using the satellite as a springboard. Costs, uses, meteorological and astrophysical aspects, physical data, instruments, etc. are discussed and illustrated with tables and diagrams and people concerned with this program, plus launchings, models of satellites and vehicles shown in illustrations. *Subject Headings:* **1. Astronautics 2. Rocketry 3. Satellite observatories 4. Interplanetary travel. I. von Braun, Wernher.**—*M.R.*

10.9–30 551.515.3

Boatright, Mody C.; Hudson, Wilson M. and Maxwell, Allen (*eds.*), **Madstones and twisters.** *Texas Folklore Society, Publications*, No. 28 (pub. by Southern Methodist University Press, Dallas), **1958.** 169 p. p. 52–79, Key, Howard C.: **Twister tales.** p. 81–90, Gillis, Everett A.: **Almanac lore. DWB** (398 B662ma)—The chapter on twisters (local U. S. term for tornado) gives in humorous or popular style the basic facts about tornadoes and a number of unbelievable (but true) stories and some legends about occurrences which demonstrate the freakishness of tornadoes, especially those in Texas annals. The chapter on almanacs gives some interesting facts about old American almanacs (of which there are over 20,000) and the lore contained in them regarding the weather, and samples of the predictions dating back to 1727 Astronomical Diary (60,000 copies). *Subject Headings:* **1. Tornado tales 2. "Twisters" 3. Almanacs 4. Weather lore.**—*M.R.*

MANUALS, ATLASES AND HANDBOOKS

10.9–31 551.5(055):551.46:551.582.3(26)

Morskoĭ Atlas, Vol. 2, Fiziko-Geograficheskiĭ [Marine atlas, Vol. 2, Physicogeographical part]. Ed. by I. S. Isakov, V. V. Shuleĭkin and L. A. Demin. (Moscow), Glavnyĭ Shtab Voenno-Morskikh Sil, **1953.** unpaged. 52 cm. 76 charts (colored), some double page. At head of cover-title: Ministerstvo Oborony SSSR. **DLC** (G1060.R8 1950 MAP). Also various reviews and translations as follows: Senkowski, H., **Radziecki "Atlas Morski,"** in *Przegląd Meteorologiczny i Hydrologiczny*, Warsaw, 7(1/2):82–83, **1954. DWB, DLC.** Shuleĭkin, V. V., **Morskoĭ atlas, 2, Fiziko-geograficheskiĭ.** *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 3:299–301, **1954. DLC.** Salishchev, K. A., **Morskoĭ atlas.** *Nauka i Zhizn'*, Moscow, No. 6:46–47, **1954.** Trans. of SALISHCHEV review into English by L. G. Robbins; ed. by W. R. Deebel, and issued as *U. S. Hydrographic Office, H. O. Translation*, No. 314, Oct. **1955.** 4 p. Mimeo. **DN-HO.** Trans. into English by L. G. Robbins of Vol. 2, p. XV–XVIII, issued as *U. S. Hydrographic Office, H. O. Translation*, No. 405, Oct. **1956.** 23 p. Mimeo. **DN-HO.** Also extensive reviews of Vol. 2 by H. W. Dubach in *American Meteorological Society, Bulletin*, 40(1):14–40, Jan. **1959** and in *Tellus*, Stockholm, 11(3):364–365, Aug. **1959. DWB.** And, finally, Dubach, H. W. and Slessers, M. A., **Evaluation of the "Morskoĭ Atlas" (with translations from Vol. 1 and 2).** *U. S. Hydrographic Office, Technical Report* TR-38, March **1958.** 441 p. **DWB** (M(055) U582t)—Vol. I of the monumental 3 volume Marine Atlas is devoted entirely to geographic and bathymetric charts of all of the world's oceans, seas, bays and harbors; Vol. II contains most of the physical, geodetic, astronomical and environmental charts (expeditions, climate, oceanography, ice); Vol. III is devoted to the political aspects of world geography: wars from the earliest times to the 20th century, etc. The only atlas that in any way approaches this in quality is the famous **Bartholomew's Atlas** which is now over half a century out of date, and not nearly as elaborate or far-reaching, either in subject matter, geographical extent or detail of data. The atlas is intended for use in marine (naval) operations, navigation, etc., but is also of great convenience for students and scientific workers interested in world geographic conditions. The **Atlas** is the work of many institutions, among them the Akademiia Nauk, the Central Geophysical Observatory, the State Oceanographic Institute and the Institute of Oceanology of the Academy of Science. In Vol. II of this elegantly reproduced Marine Atlas there are several hundred separate but well integrated climatic or oceanographic, not to mention geomagnetic, charts, maps, diagrams, etc. covering the physical conditions over the major and minor oceans and seas. In some cases the data only extends to 60° or 70°N or S lat., but in other instances the Polar seas are also included. The charts are of all sizes, ranging from full, 2-page spreads to inset charts and charts with many graphical presentations inserted in appropriate places on the charts themselves. The charts are all in many colors, with excellent contrast and high quality cartography. Sources of data and period of record used are *not* given. For each plate there is a page of descriptive text. This textual material has, as do the charts themselves, an analytical approach which is unusual in this "atlas" type of presentation of climatic data. The **oceanographic charts** are found on Plates 4–37, the **climatological charts** on Plates 41–69, and the **geomagnetic charts** on Plates 70 and 71. **Geodetic** and **astronomical charts** are found on Plates 72–76. The 300 or more **climatic charts** are on scales ranging from 1:50 million to 1:300 million. Subjects include: thermal balance (solar radiation, evaporative heat loss, turbulent thermal exchange between earth and atmosphere, heat gained or lost at sea surface by ocean currents and by evaporation); mean Jan. and July air temperature; mean Jan. and July latitudinal temperature anomaly; difference of air and water temperature (Feb., May, Aug. and Nov.); pressure and wind in Jan. and July; seasonal air mass distribution; movement and frequency of cyclones and anticyclones, Jan. and July; surface and 500 mb pressures; climatic zones of the earth; total precipitation over earth; annual temperature and precipitation regimes, monthly air temperature, wind, cloud and fog Jan.–Dec. and seasonal precipitation, pressure, wind and storm frequencies by months; winds aloft each season; annual upper air temperature regime for Reykjavik, St. Thomas, San Diego, Pensacola, Pearl Harbor, Coco Solo, Djakarta, Gibraltar and Aldergrove. **Oceanographic charts** include charts of oceanographic

expeditions from 1800 to 1950, of temperature, salinity and density, cross sections of each separate ocean and strait, polar ice, currents, tides, waves. **Geomagnetic charts** include world charts of magnetic inclination and declination, and of the horizontal and vertical components for 1950, respectively. **Astronomical charts** include time of sunrise and sunset and duration of twilight for the earth at all seasons, and stellar, solar, planetary and lunar data. Most charts are modified Mercator projections, with exception of small inset charts and charts of Polar regions. *Subject Headings:* **1. Soviet marine atlases 2. Morskoĭ Atlas 3. Oceanographic atlas of world 4. Climatological charts of world 5. World oceans and seas. I. U.S.S.R. Ministerstvo Oborony II. Isakov, I. S.** (*ed.*) **III. Shuleĭkin, V. V.** (*ed.*) **IV. Demin, L. A.** (*ed.*)—*M.R.*

10.9–32 551.501.1(02):551.481.1

U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby, **Nastavlenie gidrometeorologicheskim stantsiiam i postam, Vypusk 7, Chast' 1, Gidrologicheskie nabliudeniia na ozerakh i i vodokhranilishchakh.** [Instructions for hydrometeorological stations and posts, Vol. 7, Pt. 1, Hydrological observations on lakes and reservoirs.] Leningrad, Gidrometeoizdat, **1957.** 239 p. 47 figs., 21 tables, 21 forms in appendix (3 fold. in pocket). **DLC** (QC857.R9A47)—This is one of a uniform 10 volume series of instruction manuals (some of which have 3 or 4 parts, each a separate bound volume), giving guidance and regulations for hydrometeorological stations and posts of various types. Vol. 7 contains 2 parts, the present one having to do with specialized observations at limnological stations and hydrological posts on lakes and reservoirs. (The second part, not included in this manual, deals with evaporation measurements of lakes and reservoirs.) General types of observations are outlined under the headings of meteorological observations (precipitation and wind), hydrological observations (water level, water temperature, state of surface, ice phase and ice thickness, snow depth on ice, snow density); and according to place of observation: shore observations, near-shore observations and observations in open sectors of lake or reservoir including vertical profiles, chemical composition of water, and wind, humidity, temperature of air and light penetration, waves, etc. (in Ch. 1). The manual goes into the establishment of networks and stations (Ch. 2), equipment of various types (described and illustrated). Ch. 3 outlines procedures for carrying on observational work; (4) meteorological observations; (5) water level observations, tidal observations; (6) water temperature; (7) optical; (8) hydrochemical; (9) wind waves; (10) ice; (11) currents. Each section gives instructions for observations, care of equipment and working up of results, including sample tables, forms and graphs. Appendix gives lists of equipment needed, correction tables, sample forms and codes for recording ice. *Subject Headings:* **1. Observers manuals 2. Limnological observation manuals 3. Hydrological observation techniques 4. Ice observations techniques 5. U.S.S.R.**—*M.R.*

10.9–33 551.501.1(02):551.46

U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby, **Nastavlenie gidrometeorologicheskim stantsiiam i postam, Vypusk 9, Gidrometeorologicheskie nabliudeniia na morskikh stantsiiakh, Chast' 1, Pribrezhnye gidrologicheskie nabliudeniia.** [Instructions for hydrometeorological stations and posts, Vol. 9, Hydrometeorological observations at marine stations, Pt. 1, Coastal hydrological observations.] 2d ed. Leningrad, Gidrometeoizdat, **1956.** 290 p. 83 figs., 22 tables, 23 forms (5 fold. in pocket). **DLC** (QC857.R9A47)—This volume (1835 copies) is the first of 4 parts of Vol. 9 of the 10 volume series of instruction manuals for the observers of the stations and posts of the Hydrometeorological Service (of the U.S.S.R.). Vol. 9 deals with marine stations, and Pt. 1 with observations at off-shore stations. Equipment is described and illustrated, observational techniques, and compilation of data outlined and examples given, useful tables, charts, diagrams and forms included, and details of organization of stations set forth. Instructions for conduct of observations include: 1) Visibility toward the sea (day and night); 2) Sea-level observatories; 3) Water temperature; 4) Density and salinity; 5) Wave conditions (state of sea); 6) Ice cover; 7) Luminescence in the sea. Pt. III covers the compilation of observations of sea level, water temperature, density, drift of ice, etc. In the appendix 23 tables, or forms, are presented by way of illustrations or as working tables. *Subject Headings:* **1. Observers manuals 2. Marine observation manuals 3. U.S.S.R.**—*M.R.*

10.9–34 551.501.1:551.506.7(02)

U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby, **Rukovodstvo po podgotovke aerologicheskikh ezhegodnikov, Chast' I, Odnopunktnye vetrovye nabliudeniia.** [Instructions on the preparation of aerological yearbooks, Pt. 1, Observations of wind taken from one point.] Leningrad, Gidrometeoizdat, **1958.** 66 p. 4 figs., forms, tables. **DWB** (M01.1 U584ru), **DLC** (QC878.R83)—A standard manual of instructions for compiling, verifying and editing single theodolite upper air wind observations, summaries or yearbooks in the Soviet Hydrometeorological Service. The 1952 edition was prepared at the Leningrad Geophysical Observatory by V. D. Igrunov, and G. N. Pinegin. The work was revised and supplemented in 1956 at the Central Aerological Observatory by L. F. Tormoz and others. The subjects covered include critical review of results of pibal observations before coding, verification of cloud, wind and surface condition records for pibals, verification of ascension rate, height (both above station and above sea level), height of clouds, winds at various heights, radio and radar, wind records, comparison with winds calculated from constant pressure charts, and clouds calculated by means of other techniques with those obtained by pibal. Many examples are given in each chapter and samples (pibal) of all forms appended. *Subject Headings:* **1. Instructions for aerological yearbooks 2. Pilot balloon data computations 3. U.S.S.R. I. Moscow. Tsentral'naia Aerologicheskaia Observatoriia II. Tormoz, L. F.**—*M.R.*

10.9–35 551.5:061.1:355(02)

U. S. Air Weather Service, **Weather service for military agencies.** Its *A F Manual* 105–6, Dec. 20, **1956.** 42 p. **DWB** (M(055) U58am 105–6)—A manual outlining the operational functions of a military weather service: the objectives, actual services in the U. S., support functions, training, organization, control, and specifically the functions of the weather units in the Air Defense, Tactical Support, and Strategic Air Operations (in appendices). *Subject Headings:* **1. Military weather service 2. Air weather services.**—*M.R.*

10.9–36 551.509.312:551.547(02)

*U. S. Office of Naval Operations, **Constant pressure analysis.** Its *NAVAER* 50-1R-177) **1945.** 50 p. 9 figs., 18 tables, 7 refs. 13 eqs. **DLC** (QC885.U63)—An early manual outlining data required and procedures for constant pressure analysis. Tropopause, contrail, cross section, upper air wind, thermal wind charts are considered. Types of analysis (hodograph, standard charts, tropopause, etc.) and forecasting of geostrophic transport of thickness lines, cyclostrophic transport, temperature and wind, are then treated, and finally useful tables, nomograms and graphs are appended. Samples of chart analysis and procedures for smoothing, interpolation and extraction of data are included, along with theory and description of techniques. *Subject Heading:* **1. Constant pressure analysis manuals.**—*M.R.*

10.9–37 551.501.1:681.177(02)

U. S. Weather Bureau, **Manual of card punching (WBAN).** 6th ed. Wash., D. C., Jan **1956.** 78 p. 58 figs. (forms). Loose-leaf. Appended, **Changes, No. 1–4, 6, Jan. 15, 1956–July 1, 1957. DWB** (M01.1 U587icp 1956)—Details and examples of codes and specifications for station punching of hourly, 6-hourly, and daily surface observations, winds aloft observations, radiosonde observations, and for punching the transmitting and inventory card at Weather Bureau, Air Force and Navy stations. The punching equipment, its care and use are described and illustrated. *Subject Headings:* **1. Punched card manuals 2. Station punching of weather records.**—*M.R.*

10.9–38 551.521.12(02

U. S. Weather Bureau, **Manual of radiation observations.** Wash., D. C., Sept. **1958** 87 p. 16 figs., 7 refs. **DWB** (M21.1 U587ma)—The manual of **Solar radiation observations** (Ch. A 16 of the Addendum to the 6th Edition of **Circular N**) has been replaced by this manual. Included in this new manual are the revised instructions for the handling of hemispherical solar radiation forms, information and instructions relating to the normal incidence solar radiation and net radiation observations, as well as other changes and new materials that relate to the international pyrheliometric scale of 1956, which was recommended for world-wid

implementation on July 1, 1957 by the WMO of the United Nations. *Subject Heading:* **1. Solar radiation observation manuals.**—*N.N.*

NEW SERIALS

10.9–39 551.5(05)

Meteorological Bulletin, Taipei, Formosa, Vol. 1, No. 1, March (?) **1955.** Latest issue seen, 4(4), Dec. **1958.** Issued by Weather Forecasting and Research Center, 64 Kung Yuan Road, Taipei, Taiwan (i.e., Formosa), China. Vol. 1, No. 1, entirely in Chinese. Succeeding issues in Chinese with added title page and contents in English. Beginning with 3(2), occasional summary in English. Quarterly. All articles abstracted separately. **DLC** (Orientalia) —This new meteorological journal, now in its 3rd year, is issued quarterly (March, June, Sept. and Dec.), and each issue contains from 4 to 9 articles of an educational, informative or statistical nature, on synoptic or dynamic meteorology or climatology. Emphasis is placed on practical problems such as forecasting typhoons, numerical prediction, fallout, IGY, radar meteorology, long range forecasting, etc. (For listing of contents of Vol. 1–3, *see* p. 1180, Sept. 1958, *MAB.*) *Subject Headings:* **1. Meteorology periodicals 2. Meteorological Bulletin, Taipei. I. Formosa. Weather Forecasting and Research Center, Taipei.**—*M.R.*

10.9–40 526:550.3(05)

Studia Geophysica et Geodaetica, Prague, Vol. 1, No. 1, **1957.** Latest issue seen, Vol. 3, No. 3, **1959.** Pub. under the auspices of the Czechoslovak National Committee of Geodesy and Geophysics, by the Československá Akademie Věd. To be issued quarterly, each issue about 200 p. Editor, Stanislav Brandejs. Editorial office, Geofysikální Ústav ČSAV, Kladenská 60, Prague 6, Czechoslovakia. Price: annual 40 kčs. Articles in English, Russian and French, with summaries in language other than that of article. *Subject Headings:* **1. Geophysics periodicals. I. Československá Akademie Věd II. Brandejs, Stanislav** (*ed.*).

GENERAL GEOPHYSICS AND METEOROLOGY

IGY

See also: **Soviet Exped., Antarctic** (Krichak), 10.9–60; **Bibliog. of Russian met. literature, 10.9–76.**

10.9–41 551.506.22:551.594.6(52)

*Nagoya, Japan. Univ. Research Institute of Atmospherics. **IGY data, Vol. 1, July 1–Dec. 31, 1957.** Issued **1958.** 509 p. Entirely tables. **DWB**—This voluminous report contains data on average intensity and hourly values of atmospheric radio noise, noise records according to WMO instructions, monthly report for a narrow sector bearing according to WMO recommendations, sferics data according to statistical methods (graphs show diurnal variations and other relations), sferics fixes and wave forms, 350 pages of whistler data, and nearly 70 pages of data on solar radio emissions. Data were obtained from a network of 4 sferics IGY stations (Toyokawa, Kumamoto, Mizusawa, and Wakkanai), ranging from 33° to 45°N lat. Characteristics of apparatus and methods used are tabulated. *Subject Headings:* **1. IGY sferics networks 2. Sferics data 3. Whistler data 4. Japan.**—*M.R.*

10.9–42 550.3:061.3

Béll, Béla, **A Nemzetközi Geofizikai Év eurázsiai körzetének ülése Moszkvában.** [Conference of the Eurasian Region of the International Geophysical Year in Moscow.] *Időjárás,* Budapest, 61(3):185–190, May/June **1957.** German summary p. 185. **DLC**—The general IGY program and planned participation of the Eurasian Region are briefly discussed. Hungary will participate by increasing the frequency of meteorological, aerological, actinometric, ionospheric, geomagnetic, cosmic ray and astrophysical observations on world days. *Subject Headings:* **1. Hungarian participation in IGY 2. IGY program.**—*G.T.*

10.9–43 551.46:550.3:061.3

The Woods Hole Oceanographic Institution in the International Geophysical Year. *Oceanus*, Woods Hole, Mass., 5(3/4):37–39, **1957. DLC**—About one-sixth of the U. S. National Budget of $1,870,000 in oceanography has been granted to the Woods Hole Oceanographic Institution for the support of their programs on deep currents of the Indian ocean, the Arctic Observation, apparatus and analysis programs of various studies related to the radio-active elements. Programs are in cooperation with those of the Lamont Geological Observatory, Texas Agricultural and Mechanical College, the Scripps Institution of Oceanography, the University of Washington, and those of several Government facilities who participate during this I.G.Y. *Subject Headings:* **1. IGY oceanography program 2. Woods Hole Oceanographic Institution.**—*N.N.*

10.9–44 551.507.362.2:551.506.22

First US-IGY Satellite. *American Geophysical Union, Transactions*, 39(2):353–355, April **1958.** 2 figs. **DWB, DLC**—On Jan. 31, 1958 at 10:48 EST the first US-IGY satellite, 1958α, was launched from Cape Canaveral, Fla. The U. S. Army Ballistic Missile Agency and the Jet Propulsion Laboratory of the California Institute of Technology worked together to develop the launching vessel which was a four-stage modified Jupiter-C rocket. The rocket's electric motors were used to spin the upper stages at 450 rpm before take-off. After take-off the spin was increased to 700 rpm. The over-all length of the composite vehicle is 823.3 in. Its orbital speed increases to approximately 18,000 mph. Its final stage carries the scientific instrumentation to measure the total cosmic-ray intensity, density of meteoric matter in the satellite's orbit, and for measurements of temperature both within and at the skin of the satellites. Minitrack and microlock stations in different parts of the world are engaged in tracking the 1958α. Discussions on the observations and the orbit are contained in the paper. *Subject Headings:* **1. IGY satellite program 2. Satellite observatories.**—*N.N.*

10.9–45 551.507.362.2:77

Volunteer participation in the IGY earth satellite program. *American Geophysical Union Transactions*, 38(6):1007–1009, Dec. **1957.** Also: **Phototrack.** *Ibid.*, 39(2):355–360, April **1958.** 3 figs. **DWB, DLC**—The first article discussed the program for volunteer photographic observations of earth satellites. This program was endorsed by the USNC-IGY and came to be known as Phototrack. It was supported by the Society of Photographic Scientists and Engineers (SPSE), designed to take satellite photographs in conformity with certain specifications listed in this text. A phototrack station requires an unobstructed view of the sky, freedom from local sources of light, a location near a source of 60-cycle electric power accessibility and a "closed loop" survey of its location tied into the U. S. Triangulation net with not more than one foot total error. The paper contains materials on "emulsion and lenses," "communications for prediction data" and on how to use these data. *Subject Heading* **1. Satellite photography.**—*N.N.*

10.9–46 551.46:550.3:061.

Bückmann, Adolf (*Hamburg*), **Biologische Probleme im Nordatlantischen Ozean in Internationalen Geophysikalischen Jahr 1957/58.** [Biological problems in the N. Atlanti Ocean in the I.G.Y., 1957–58.] *Naturwissenschaftliche Rundschau*, Stuttgart, 11(3):89–96 March **1958.** 9 figs. (incl. photos), 25 refs. **DWB, DLC**—One of the tasks of the oceanograph sector during the IGY 1957–58 is an international study of the polar front in the N. Atlanti Ocean. The area of investigation, for which West Germany is responsible, lies south Iceland and Greenland up to the Azores and includes the northern extension of the Gulf Strea A brief account is given of some earlier German activity in this region with the "Meteor "Gauss" and "Anton Dohrn." The author discusses the particular suitability of the ocea for studying quantitatively the metabolic cycle, the transport of nutrient substances to ope oceanic areas (in cool regions, particularly at the boundary of warm and cool waters), whe extensive masses of phytoplankton are present, the distribution of phytoplankton at vario depths in regions of instability where cold and warm water adjoin, the problem of countin the phytoplankton, and determination of the species, composition of the plant plankton, th determination of the production rate of phytoplankton and methods of its study, such as th

use of radioactive isotopes; the distribution of animal plankton, catabolic processes in oceanic waters; the fishery biology including the life cycle and migration of the cod. Maps showing the distribution of the very cold surface waters originating from the European northern ocean and the distribution of the perch (*Sebastes marinus*) are presented. *Subject Headings:* **1. IGY oceanography program 2. Polar front in North Atlantic 3. North Atlantic Ocean.**—*I.L.D.*

10.9–47 551.506.22:002(99)

Microtext libraries at IGY bases. *Library Journal*, N. Y., 83(5):703–705, March 1, **1958.** photo. **DLC**—The research base of U. S. Weather Bureau scientists at the Weather Central station in Little America is described with special emphasis on the group's library consisting of a compact microtext reader and several 3 × 5″ cards, each containing the equivalent of up to 80 average-sized pages of printed material. *Subject Headings:* **1. IGY stations 2. Microtext libraries 3. Little America.**—*G.T.*

WMO

10.9–48 551.5:061.3:025.45

Bull, G. A., **World Meteorological Organization Commission for Bibliography and Publications, Nov. 5–22, 1957.** *Meteorological Magazine*, London, 87(1030):115–116, April **1958. DWB, DLC**—At this meeting of the W.M.O. Commission for Bibliography and Publications, the meteorological section (551.5) of the Universal Decimal Classification was brought up to date by adding a number for artificial satellites, changes in classification of snow cover were adopted, and monthly accession list of the Library of the Meteorological Office was taken as the basis of a provisional World Meteorological Bibliography, etc. A working group on the International Meteorological vocabulary completed its work with the preparation of a draft vocabulary in French, English, Spanish and Russian, and definitions of the terms in French and English. A system of Cyrillic transliterations was recommended. *Subject Headings:* **1. WMO. Bibliography and Publications Commission 2. WMO. meetings 3. U.D.C. for meteorology 4. Meteorological glossaries.**—*I.L.D.*

10.9–49 551.508:06.045

Langlo, K., **Second session of the Commission for Instruments and Methods of Observation.** *World Meteorological Organization, WMO Bulletin*, 6(4):146–149, Oct. **1957.** photo. **DWB**—Meeting held in Paris June 18–July 6, 1957, attended by 36 members, etc. Twelve resolutions and 18 recommendations were passed on: (1) standardization of Meteorological observations; (2) hydrometeorological measurements; (3) international reference precipitation gage; (4) radiation and upper air measurements. Seventeen lectures were arranged on instrument development, radar and radiation measurement, etc. *Subject Heading:* **1. WMO. Commission for Instruments and Methods of Observation.**—*M.R.*

10.9–50 551.508:06.045

World Meteorological Organization. Commission for Instruments and Methods of Observation, **Abridged final report of the Second Session, Paris, June 18–July 6, 1957.** *WMO [Publications]*, No. 64, RP. 26, **1957.** 79 p. tables. Price: Sw. fr. 3. **DWB** (M(06) W927p)—The formal report on the 93 attendants from 42 countries, the agenda, resolutions and recommendations, and a general summary of the transactions of the second session of CIMO, Paris, June 18–July 6, 1957. A list of 85 documents distributed at the session and 8 annexes concerning future work of CIMO, working groups, radiosonde comparisons, technical regulations, radiation measurements, precipitation gage standards, etc., are appended. The President of CIMO, A. PERLAT of France, presided. He was re-elected along with L. M. MALET of Belgium, as Vice President. *Subject Headings:* **1. WMO. Commission for Instruments and Methods of Observation (CIMO) reports 2. Instruments and observations.**—*M.R.*

10.9–51 551.509.3:06.045

World Meteorological Organization. Commission for Synoptic Meteorology, **Abridged Final Report of the Second Session, New Delhi, Jan. 21–Feb. 15, 1958.** *World Meteorological Organization, WMO [Publication]*, No. 74. RP. 30, **1958.** 209 p. **DWB** (M(06) W927p), **DLC** (QC851.W6445)—Conference at New Delhi was attended by 74 representatives from

35 member countries and 1 from Iran, (non-member) and 10 others. In this standard WMO report, 89 recommended actions and 170 documents are listed and amplified by detailed annexes giving recommended codes, specifications, charts, lists of stations, broadcasts, etc. *Subject Headings:* **1. WMO. Commission for Synoptic Meteorology 2. New Delhi, India.** —*M.R.*

ARCTIC RESEARCH

10.9–52 551.524.4:551.311.17(988)

Pluvinage, P. and Taylor, G. (*French Polar Expeditions of Strasbourg Univ.*), **La température de l'air dans les premiers mètres au-dessus de l'Inlandsis Groenlandais.** [Temperature of the air in the first meters above the Greenland Ice Cap.] *Annales de Géophysique*, Paris, 12(2):157–166, **1956.** 6 figs., 5 tables, 4 refs. French summary p. 147. At head of title: Rapports Scientifiques des Expéditions Polaires Françaises N IV 1. **DLC**—Vertical temperature profile measurements made by thermocouples from 0–3 m at Station Centrale are described, showing the experimental setup. A statistical evaluation is made and typical cases are discussed. *Subject Headings:* **1. Temperature profiles 2. Greenland Ice Cap 3. Station Centrale, Greenland.**—*A.A.*

10.9–53 551.5:908(98)

Reed, John C., **The United States turns North.** *Geographical Review*, 48(3):321–335, July **1958.** 8 figs. **DLC**—After a brief sketch describing the gradual awakening of U. S. interest in the Arctic, the author outlines the status of our Arctic knowledge and reviews some of the research activities in the North, including the U. S. Arctic Program and the IGY. The discussion includes a brief sketch of Arctic environments and a statement of various biological, physical and engineering problems that require solution in order to understand and utilize the Arctic. These include for example the adaptation of warm blooded animals including man to Arctic conditions, the cycles of various Arctic animals, the origin of Arctic weather and its effect upon the Northern Hemisphere, construction under permafrost conditions, etc. The current economic and military activity in the Arctic is summarized. The scope of U. S. research in the Arctic, and the U. S. Arctic IGY Program carried on at Thule (Greenland), Fort Churchill (Canada), Point Barrow (Alaska), McCall Glacier (Alaska) and Drifting Stations A and B are described. *Subject Headings:* **1. Arctic research 2. Arctic.**—*I.L.D.*

10.9–54 551.507.2(98)

Iatsun, Evgeniĭ Pavlovich, **Na l'dine cherez polius: zapiski kinooperatora.** [Across the Pole on the ice: report of a camera man.] Izdatvo Tsk. Vlksm "Molodaia gvardiia," **1957** 251 p. figs. and photos. **DWB** (919.8 Illna)—This is one of a series of books published in recent years to propagandize the conquest of the Arctic, especially among the younger generation of the Soviet Union. Written by a camera man who took part in the expedition, it gives a lively picture of the work and every-day life of Arctic explorers and scientific workers on the drifting station "Severnyĭ Polius" 3 from 9 April 1954 to 20 April 1955. The book does not contain any important scientific or meteorological information. *Subject Headings:* **1. Arctic drift expeditions 2. "Severnyĭ Polius Expedition," 1954/55 3. Arctic.**—*A.M.P.*

10.9–55 551.578.41(98

Klinov, F. Ia., **Poliarnyĭ sneg.** [Polar snow.] *Akademiia Nauk SSSR, Izvestiia, Se Geofiz.*, No. 6:796–799, **1958.** 5 figs., table, 4 refs. **DLC**—The shapes of ice crystals (snow flakes) constituting polar (cold) snow and the atmospheric conditions (air, temperature and humidity) associated with their formation are discussed on the basis of observations made Verkhoyansk during 1953–1954. The most common forms of ice crystals occurring at temperatures below −40°C as precipitation from the free atmosphere are rodlike, combinations of rods and plates arising from the same nucleus, prisms, "projectile like," etc., their size ranging from 200 to 800μ. In the atmospheric layer immediately near the earth's surface there observed, at temperatures below −50°C, an intense precipitation of crystalline shapes, which do not exceed 100 in size and usually are small—even as small as 10μ. These and other types of ice crystals are described and illustrated by photographs and drawings. The complex for

of ice crystals falling from the free atmosphere appear as mass forms of snow flakes at low negative temperatures and these forms differ in consisting of homogeneous and diverse crystalline structures. Observations on ice crystals formed during intense snowfall under conditions marked by an absence of cloudiness in the lower layer of the atmosphere indicated that, in crystals in the form of small platelets, plate-like needles, and prism grains originated at high altitude. Around the moon a bright gray halo with an angular dimension of 1°20′ was visible. Another description is presented of the shapes of ice crystals associated with the appearance of various lunar phenomena. *Subject Headings:* **1. Ice crystal forms 2. Snow crystal formation 3. Arctic.**—*I.L.D.*

10.9–56 551.506.3(988)

*Denmark. Meteorologisk Institut, **Summaries of weather observations at weather stations in Greenland, 1949–1953.** Charlottenlund, **1958.** 113 p. Almost entirely tables and charts. **DWB** (M06.2/988 D397su 1949–53)—The following statistical data are presented on the basis of observations made at the Greenland stations during the period 1949–1953: 1) Number of simultaneous occurrences of specified visibility ranges and specified ranges of base of cloud; 2) Number of occurrences of fog, precipitation, and drifting snow; 3) Frequency of surface winds in %; and 4) Number of occurrences of specified values of surface temperatures (available for a few stations only). Data for 1954–1958 are now being analyzed and the work is expected to be completed during 1959. *Subject Headings:* **1. Arctic meteorological data summaries 2. Greenland.**—*Authors' abstract.*

10.9–57 551.510.535(98)

Gassmann, George J. (*A.F. Cambridge Res. Center, Mass.*), **Measurements of irregularities and drifts in the Arctic ionosphere using airborne techniques.** (In: Polar Atmosphere Symposium, Oslo, July 2–8, **Proceedings, Pt. 2, Ionosphere Section,** N. Y., Pergamon Press, (**1958?**) p. 44–51. 17 figs., 7 refs., eqs. **DLC.** Also issued in *Journal of Atmospheric and Terrestrial Physics*, London, Special Supplement, Pt. 2, **1957.** p. 44–51. **DWB, DLC**—The airborne observations in this article were made in 1954 and 1955 by the 6520th Air Force Test Group in the area between Fairbanks, Alaska and Thule, Greenland and the North Pole; they are similar to the investigations on the irregularities and drifts in the Arctic ionosphere made some years before. The National Bureau of Standards and the Canadian Defense Research Board have cooperatively made these records available. This work reveals that only during the high ionospheric activity can the Z-mode be recorded all the time of an Arctic flight. A new method of measuring ionospheric drifts is included here whereby the fading curve of the phenomena is divided into 10 sec. sections. The sum of all changes in amplitude, measured from maxima to minima, for each section is then divided by the time and the average amplitude.

$$A = \text{Normalized average speed of fading} \approx \frac{\Sigma/\partial\ (\text{amplitude})}{\partial\ (\text{time})} \cdot \frac{1}{\text{amplitude}}$$

The quantity A is proportional to the speed of the aircraft relative to the moving ionospheric field strength pattern. Finally, the drift speed can be obtained by the simple formula:

$$\frac{\text{speed of airplane} + \text{speed of drift}}{\text{speed of airplane} - \text{speed of drift}} = \frac{\text{Maximum value of } A}{\text{Minimum value of } A}$$

The Arctic drift in this example came out to be 33 m/sec. where the minimum curve was near 270°. Another measurement made in Jan. 1955 at 0130 UT, using an F-layer reflection, resulted in 41 m/sec. toward 290°. *Subject Headings:* **1. Ionospheric drift 2. Air-borne ionospheric measurements 3. Arctic.**

ANTARCTIC RESEARCH

10.9–58 551.506.5(99) 551.46:91.04(99)

*Diaz, Emilio Luis, **La Campaña Antártica, 1955–1956.** [Antarctic Expedition, 1955/1956.] *Sociedad Científica Argentina, Anales,* 162(3/4):63–88, Sept./Oct. **1956.** 10 figs. (incl. photos). Reprint issued as *Argentina. Instituto Antartico Argentino, Contribución,*

No. 11. (*See* 6.7–43, July 1955, *MAB* for 1951–1952 expedition.) **DWB**—As commander of an Argentinian Antarctic Naval Group, the author describes the 1955–56 expedition, including scientific activities in the fields of oceanography, geomagnetism, astronomy, gravimetry, glaciology, zoology, paleontology, meteorology and ionospheric observations. Meteorological work comprised both surface and upper air observations in the Southern Atlantic and the Weddell Sea. From these observations it was found that data obtained on Thule Island can usefully serve to characterize weather conditions in the Atlantic and the Weddell Sea and it was therefore decided to maintain a weather station on Thule Island during the IGY. *Subject Headings:* **1. Antarctic expeditions 2. Argentine Antarctic Expedition, 1955–1956 3. Weddell Sea 4. Thule Island.**—*G.T.*

10.9–59 551.584.32:551.311.17(99)

Avsiuk, G. A.; Markov, K. K. and Shumskiĭ, P. A., **Kholodnaia pustynia v Antarktide.** [Cold desert in the Antarctic.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geog.*, No. 4:16–25, **1956.** 10 photos. **DWB**—On the basis of personal observations, the authors stress the desert character of Antarctica, which appears to be a relic of some more severe and primitive epoch of the earth's past. Two types of deserts are distinguished: glacial and cold deserts. The contemporary glaciation of Antarctica, including the adjoining shelf ice, amounts to 13.5×10^6 /km²; of this total, about 4% is free of ice cover. The total ice volume is 17.2×10^6/km³. Below the upper active layer of ice the ice temperature is in the order of −40°C at a distance of 600 m from the coast (close to annual mean air temperature). The combination of the cold, high, ice-covered southern polar continent with surrounding oceanic waters produces very special physical geographic conditions on the continent, namely: unusual low temperatures, moisture deficit and absence of life. All these conditions produce the cold Antarctic desert. The physical geographic zones are concentric about the center of the continent. These constitute the coastal zones of all Antarctica surrounding the central part. The meteorological, ice and relief conditions of both zones are described. The cold deserts, which are ice-free, are designated "oases" and nunataks; they resemble high altitude deserts of the middle latitudes (high altitude regions of the Eastern Pamir, for example). "Oases" are present in almost all outlying areas of Antarctica—Queen Mary Land, Marie Byrd Land, Queen Maud Land, etc.—and they are all similar in origin, in climate, physical geographic conditions, etc. The Bunger Oasis is situated between 66° and 66°.5 South lat. and 100°.0 and 101°.8 East long. in eastern Queen Mary Land; this area of 600 km² has an ice free sector of 50×20 km. The oasis is a part of the east Antarctic platform of gneiss and granite. The oasis was originally ice covered as is evident from moraines, streaks, etc. The adjoining Antarctic coasts are in the extreme limits of the Antarctic anticyclone; hence, are subject to the entire Antarctic low pressure belt with the accompanying precipitation (600–750 mm per year). The "oasis" has a characteristic local climate. The tops of hillocks are free from snow even in winter. In spring and summer, the rock surface reaches a temperature of 25–30°C. The relative humidity of the atmosphere varies between 10–50% by day. The oasis has a desert-like character owing to radiational heating. Snow accumulations on the lee of hillocks become the source of rivulets and small lakes after the period of snow melt; at the end of summer, the water temperature may reach 9.5°C at an air temperature of 2.5°C. While the interaction of the solid and liquid phases of water are but little developed, evaporation and weathering are intense. Plant life is very meager owing to the extreme drought. The "oasis" is several thousand years old and it has arisen as a result of the fact that ice by-passed the area owing to its relief and the removal of snow from the surface by wind. A comparison is made between the "oasis" and the periglacial area of Europe during the Quaternary period. It is concluded that they are similar in most respects, except that in the Bunger oasis chemical weathering is extremely well developed. Also, while both the anticyclonic winds in ancient Europe and Antarctica have an easterly direction, the ancient continental dunes of Europe have been accumulated by vertical rather than by eastward winds. *Subject Headings:* **1. Cold desert 2. Ice "oases" microclimatology 3. Bunger Oasis, Antarctica.**—*I.L.D.*

10.9–60 550.3:91.04:061.3(9

Krichak, O. G., **V Antarktide.** [In the Antarctic.] *Meteorologiia i Gidrologiia*, Leningrad, No. 6:63–64, June **1957. DWB**—The second Soviet expedition to the Antarctic consisted

two diesel electric ships "Ob' " and "Lena," which arrived in the Arctic in 1956 and the steamer "Kooperatsiia." During their voyage all three ships made aerological, meteorological and actinometric observations. The author describes the special problems attending the unloading of the "Kooperatsiia" and the "Lena" as it took place during the Antarctic summer. In connection with the IGY, this expedition is to establish new stations in the interior. These stations included Vostok, in the southern geomagnetic pole, and an intermediate station, Komsomol'skaia. The duties of the various stations (Mirny, Pionerskaia and the above two) are described and their directors are listed. The arrival of GORDON CARTWRIGHT on the "Kooperatsiia" is mentioned. *Subject Headings:* **1. Soviet Antarctic Expedition 2. Soviet participation in IGY.**—*I.L.D.*

10.9–61 551.5(99)

Bennett, Iven, **Antarctic meteorology.** *Geographical Review*, 48(3):438–439, July **1958.** **DLC**—The author discusses three publications of E. VOWINCKEL of the Union of South Africa Weather Bureau, on the meteorology of the Antarctic Ocean. These studies are based upon some 160,000 marine observations made during the period 1920–1955 and were published in the *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vol. 7, **1956,** p .317–341 and p. 342–369 and Vol. 8, **1957,** p. 75–102 (*see* 8.2–278, Feb. and 8.6–334, March 1957, *MAB*). These papers contain extensive data on air and sea temperatures, heat budget of the sea surface, wind, pressure and short term weather variations. The polar front is shown as a nearly continuous belt that is apparently only slightly displaced latitudinally during summer. The subpolar trough of low pressure also is presented as a continuous belt rather than as a series of discrete lows in the Northern Hemisphere. South of the Antarctic Convergence and circling the continent with only minor interruptions is a zone in which isothermal conditions prevail. Except for the Ross and Weddell Seas mean temperatures were higher in the decade 1945–1955 as compared with 1920–1934. *Subject Heading:* **1. Antarctic meteorology.**—*I.L.D.*

10.9–62 551.501.9(99)

Rusin, N. P., **Meteorologicheskie issledovaniia v Antarktide.** [Meteorological investigations in the Antarctic.] *U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby. Komitet po Provedeniiu Mezhdunarodnogo Geofizicheskogo Goda, Informatsionnyĭ Sbornik*, No. 4:20–31, **1957.** 2 photos. **DWB**—The meteorological program of the Antarctic Expedition of the Academy of Sciences of the U.S.S.R. at Mirny included twice daily temperature and wind observations by means of radiosondes, four principal (1, 7, 13, and 19 hours) and four supplementary (4, 10, 16 and 22 hours) observations according to second order stations schedule (continuous recording of temperature, humidity and pressure), actinometric observations at four fixed periods (continuous recording of total radiation and radiation balance), collection of synoptic data, preparation of the synoptic map and weather service for airplane flights. The principal weather observations were begun Feb. 11, 1956 and complete operation began in May 1956. The author describes the layout of the principal and supplementary stations, the equipment, the difficulties encountered in making observations as a result of snow storms and snow accumulations which hampered the functioning of the instruments and the work of the observers; the observation schedule at Pionerskaia Station; the organizations and observations of special stations for studying wind and microclimatic conditions, and the station and observations at the Bunger Oasis. Descriptions of the seasonal regime at Mirny, of the characteristics of air temperature, humidity and wind conditions at Mirny and also at Pionerskaia including numerical data are given and the names of the investigators at the various stations are listed. *Subject Headings:* **1. Antarctic weather stations 2. Antarctica.**—*I.L.D.*

10.9–63 551.506.7(99)

Tauber, G. M., **Aerometeorologicheskie issledovaniia v Antarktide I Sovetskoĭ antarkticheskoĭ ekspeditsii 1955–1957 gg.** [Aerometeorological investigations in the Antarctic by the first Soviet Antarctic Expedition, 1955–57.] *Meteorologiia i Gidrologiia*, Leningrad, No. 6:3–11, June **1957.** **DWB**—The scope of the meteorological observations during the First Soviet Antarctic Expedition, the apparatus employed and the leading personnel are listed. At Mirny radiosonde observations were made regularly in order to study the atmospheric

circulation and the radiosonde procedure employed is described. Also, the equipment and the type of meteorological observations made at the stations "Oazis" and "Pionerskaia," and the meteorological observations made in the Southern Indian Ocean are described. A brief account is given of the atmospheric circulations in Antarctica, the nature and path of cyclones, the temperature regime at Mirny, the wind regime, etc. Scattered numerical data are given in the text. *Subject Headings:* **1. Antarctic meteorology research 2. Upper air soundings 3. Antarctica.**—*I.L.D.*

SERVICES, INSTITUTIONS AND OBSERVATORIES

See also: **Woods Hole Oceanog. Inst. and IGY,** 10.9–43; **Oceanog. island observatory, Iceland,** 10.9–80; **Sea wave recording sta., Livorno, Italy** (Bossolasco), 10.9–84.

10.9–64 551.5:061.1(09)(549)

Pakistan. Meteorological Service, **Report on administration and development of meteorology and geophysics in Pakistan up to March 31, 1956.** (1957?). 12 p. 3 figs. (incl. folded chart of Rainfall of the Punjab, July 16–Sept. 15, 1954). Appendix 3: List of 110 titles of papers by staff members (and others), mostly in manuscript form, 1947–1956. **DWB**—This is an annual report on the administration and development of meteorology and geophysics in the Federation of Pakistan from the period immediately after their independence in August 1947 up to March 31, 1956. It shows the enormous expansion of meteorological responsibility and its place in a fast growing state such as Karachi. It is a record on the history and developments in the different areas of weather observations arranged under the following headings: the administrative set-up; observatories; forecasting offices; the regional meteorological centers; the headquarters organization; flood forecasting and warnings; river navigation weather warning service; the meteorology of their arid zone and humid tropics; cloud physics and artificial rain, meteorological service for animal husbandry; agriculture; forestry; geophysical organization; mountaineering expeditions; the total solar eclipse of 30th June, 1954; solar physics; the international geophysical year 1957–1958; research and investigation; the position of meteorological service in international circles; cooperation with U.N. agencies; the distinguished visitors and the expansion of meteorological activities in Karachi. *Subject Headings:* **1. Meteorological services 2. Pakistan Meteorological Service 3. Pakistan. I. Naqvi, S. N.** (*dir.*)—*N.N.*

10.9–65 551.5:061.

Sinel'shchikov, V. V., **Soveshchanie aktiva rabotnikov gidrometsluzhby Kazakhstana** [Conference of the employees of the hydrometeorological service of Kazakhstan.] *Meteorologiia i Gidrologiia*, Leningrad, No. 4:63, April **1957. DWB, DLC.** English transl. available **DWB** (M06S61co)—The conference dealt with the problem of improving the hydrometeorological service of Kazakhstan so that it could aid the development of the national economy. Special attention was given to the expansion of the hydrometeorological network in order to improve the forecast service to collective and state farms, to the nomadic animal industry, to commercial aviation of Kazakhstan which by 1956 had increased 30% over 1950. The hydrometeorological service is to play a greater role in the development of the hydroelectric industry. *Subject Headings:* **1. Meteorological services 2. Soviet meteorological services 3. Kazakhstan, U.S.S.R.**—*I.L.D.*

10.9–66 551.509:061.

Simić, M., **Služba prognoze vremena.** [Weather forecasting service.] *Yugoslavia Hidrometeorološka Služba, Vesnik*, 6(1/2):30–34, Jan./June **1957. DWB**—The development of the Yugoslav Forecasting Service from its beginnings in 1941 is outlined. Weather forecasting services are now in operation at the Federal and Provincial Hydrometeorological Services and for the Military Aviation. Twenty four hour forecasts are issued reporting on the basis of 4 charts each for Europe, the Mediterranean area and Yugoslavia, seven upper-air

charts (850, 700, 500 and 300 mb), 4 aerological diagrams for each of the stations Belgrade, Zagreb and Split, upper-air data for foreign stations, vertical sections, etc. *Subject Headings:* **1. Yugoslav forecasting service 2. Yugoslavia.**—*G.T.*

CONFERENCES AND SYMPOSIA

See also: **WMO Comm. for Synoptic Met., New Delhi, 10.9–51.**

10.9–67 551.574.1(08)

Dessens, H., **Compte rendu du Symposium sur la Physique et la Dynamique des Nuages au Congrès de l'U.G.G.I., (Toronto 21 septembre 1957).** [Proceedings of the Symposium on Cloud Physics and Dynamics, at the I.U.G.G. Congress, Toronto, Sept. 21, 1957.] *Puy de Dôme. Observatoire, Bulletin*, Ser. 2, No. 3: 94–96, July/Sept. **1957. DWB**—Over 100 attended symposium on cloud physics and dynamics at Toronto on Sept. 21, 1957 at I.U.G.G. meeting. About 10 of the papers presented there are reviewed (Facy, H. W. Georgii, R. Sanger, H. Dessens, B. Vonnegut, J. S. Marshall, A. Kh. Khrgian, V. Ia. Nikandrov, W. E. Howell and others). *Subject Headings:* **1. Cloud physics symposia 2. Symposium on Cloud Physics and Dynamics, Toronto, Sept. 21, 1957 3. I.U.G.G. Meeting, Toronto, 1957.**—*M.R.*

10.9–68 551.5:061.3

Budyko, M. I., **Meteorologicheskaia konferentsiia v Berline.** [Meteorological conference in Berlin.] *Meteorologiia i Gidrologiia*, Leningrad, No. 1:65, **1958. DWB, DLC**—The first scientific conference of the Meteorological Society (organized in March 1957) was held in Berlin during Oct. 14–16, 1957. The participants included the German Democratic Republic, Austria, Hungary, Poland, the U.S.S.R., the German Federal Republic, and Czechoslovakia. The various sections of the conference and their chairmen are listed. Special mention is given to Flohn's paper on synoptic meteorology and the general circulation, to the papers of Brandejs and Kozma on methods of short range forecasting with the aid of the equations of dynamic meteorology, to papers on resort climatology, and to papers on the temperature of the earth's surface by Budyko, etc. *Subject Headings:* **1. Meteorological conferences 2. Meteorological Society of East Germany.**—*I.L.D.*

10.9–69 551.5:551.583:061.3

Buchinskiĭ, I. E., **Zasedanie sektsii meteorologii i klimatologii Nauchnotekhnicheskogo soveta GUGMS.** [Meeting of the Section of Meteorology and Climatology of the Scientific-Technical Council of the Central Directorate of the Hydrometeorological Service (GUGMS).] *Meteorologiia i Gidrologiia*, Leningrad, No. 2:60, Feb. **1958. DWB, DLC**—The meeting was held Oct. 22, 1957. A paper was given by S. A. Sapozhnikova entitled **Condition and prospects of analyzing climatic changes.** A brief summary of this paper and of the discussion is given. The section of general meteorology and climatology of the Scientific Technical Council of the GUGMS discussed the necessity of investigating climatic change and climatic forecasting and various approaches to their studies. *Subject Headings:* **1. Meteorological conferences 2. Climatic changes 3. U.S.S.R.**—*I.L.D.*

10.9–70 551.5:061.3:621.39

Pogvinov, K. T., **Mezhdunarodnoe soveshchanie po voprosam gidrometeorologii.** [International conference on hydrometeorological problems.] *Meteorologiia i Gidrologiia*, Leningrad, No. 6:64–65, June **1957. DWB**—In March 1957 a working conference of representatives of the hydrometeorological services of Albania, Bulgaria, East Germany, Poland, U.S.S.R., Romania and Czechoslovakia met in Berlin. The principle purpose was to work out a method for uniting the meteorological telegraphic network of Central and Eastern Europe. In 1955 direct communication was established between Moscow-Warsaw-Potsdam, Moscow-Prague, Moscow-Bucharest, Bucharest-Sofia, Bucharest-Budapest-Prague, Prague-Potsdam and Prague-Warsaw. In pursuance of the resolution of the second European Regional Conference

of the WMO (Dubrovnik 1956) to unite the teletype network of Western Europe with that of Central and Eastern Europe the Berlin conference recommended organization of teletype communication between Prague-Frankfurt a.M. and Potsdam-Frankfurt a.M. The direct exchange of meteorological and aerological observations between East and West, the exchange of surface and upper altitude observations at 0000 and 1200 hours, etc. were some of the proposals. *Subject Headings:* **1. Meteorological conferences 2. Telecommunication 3. International cooperation in meteorology.**—*I.L.D.*

10.9–71 551.510.62

Bean, B. R. (*Radio Met. Sec. Natl. Bur. of Standards, Boulder, Colo.*), **First meeting on radio climatology.** *Institute of Radio Engineers, Proceedings*, 46(7):1425–1426, July 1958. eq. **DWB, DLC**—On Jan. 15, 1958, a meeting was held at the Boulder Laboratories of the National Bureau of Standards, to determine methods and standards for compilation of radio propagation indexes based on meteorological data. The U. S. NBS, Air Defense Command, Army Signal Radio Propagation Agency, Army Electronic Proving Ground, Navy Weather Research Facility, and Naval Electronics Laboratory were represented. Agreement was reached that constants $K_1 = 77.6$ and $K_2 = 4810$ should be used in expressions for refractivity in formula $N = \frac{K_1}{T}\left(P + \frac{K_2 e RH}{T}\right)$ where P is station pressure (mb), RH—relative humidity, e—vapor pressure in mb at absolute temperature T (Kelvin). Also a listing should be made of past data for general use and these and all punched cards at the N.W.R.C. (Asheville) should be sent to C.R.P.L. (Boulder). Calculations of radio-refractivity will be made from radiosonde data at N.W.R.C. and five years of daily observations for February, May, August and November will be minimum for radio climatology of a place. *Subject Headings:* **1. Radio climatology meetings 2. Refractive index calculations.**—*M.R.*

10.9–72 551.574.1(08)

International Symposium on Condensation Nuclei, 3rd, Cambridge, July 16–18, 1958. **Proceedings.** Issued in *Geofisica Pura e Applicata*, Milan, Vol. 42, **1959.** 151 p. figs., tables, refs., eqs. For listing of contents, *see* Pt. III, p. 634, April 1959, *MAB*. Most articles abstracted separately. **DLC.** *Subject Heading:* **1. Condensation nuclei symposia.**

EDUCATION, HISTORY AND BIOGRAPHY

EDUCATION

10.9–73 551.5:02

Arakawa, Hidetoshi, **Amerika no kokukaitoshokan to beieitoku no sandai kisho toshokan** [The American Library of Congress and three large meteorological libraries in the United States, England and Germany.] Bungei-shunshu (pub. Japan), 6(9):6–8, Sept. 1, **1955. DLC**—Main and annex buildings of the Library of Congress are described. The author visited them while he was working for *Meteorological Abstracts and Bibliography* (in Annex Study Room 169) in 1955. Brief notes on the Weather Bureau libraries of U. S., Britain and West Germany are added. *Subject Headings:* **1. Library facilities 2. Meteorological libraries 3. U. S. Library of Congress 4. United States 5. Great Britain 6. West Germany.**—*J. Woo.*

10.9–74 551.5:37

Lloyd, D. C., **Meteorology in education.** *Weather*, London, 12(12):392, Dec. **1957. DWB, DLC**—The writer regrets the deletion from the 1958 "A" and "S" physics examinations for Oxford and Cambridge of questions on water vapor in the atmosphere, dew point and relative humidity determination, cloud, fog, dew, hoar frost, hail and snow formation, which he thinks will lead to the neglect of meteorology in "grammar school" instruction. The "O" level physics candidates will still have to know about these subjects to pass the examination. *Subject Heading:* **1. Teaching of meteorology.**—*M.R.*

HISTORY

See: **Progress in climatology** (Keil), 10.9–283.

BIBLIOGRAPHY AND ABSTRACTING

See also: **Bibliog. on Evapotranspiration,** p. 1394.

10.9–75 551.574.7:016

†McConica, Thomas H., III, **Bibliography of ice and frost control (Pt. 1).** Arctic Research, nc., Contract AF 33(616)-3156, (Unnumbered Report), Jan. **1958,** issued as *U. S. Wright Air Development Center, WADC Technical Report,* 56-338, Pt. 1. 126 p. 319 items with abstracts. 'Review of the patent literature is included in Pt. 2." **DWB** (M(016) M129bi)—This volume s a review of all unclassified articles on the control of ice and frost for the period of July 1955 o June 1956. Original reports have been abstracted, and the bibliographies, depository and all number of each reference report have been included. Subject matter is treated under the ollowing: adhesion, water and ice, formation of ice and frost on aircraft, control of ice and rost on aircraft, and the zone of protection. *Subject Headings:* **1. Ice and frost control bibiographies 2. Icing of aircraft 3. Icing bibliographies.**—*N.N.*

10.9–76 551.5:016

†Akademiia Nauk SSSR. Mezhduvedomstvennyĭ Komitet po Provedeniiu Mezhdunarodnogo Geofizicheskogo Goda, **Bibliograficheskiĭ ukazatel' literatury na russkom iazyke za 1954–1957 gg.** [Bibliographical index of literature in the Russian language for 1954–1957.] Moscow, **1958.** 41 p. 452 titles cited (some of which are analyzed as to pertinent articles). 7-p. in French and Russian. Legends in Russian and English. **DWB.** Brief review in *Nature,* London, 181(4625):1702, June 21, 1958. **DLC**—The index which consists of 452 itles of books, journal and newspaper articles (dedicated to IGY) published during 1954–1957 n the U.S.S.R., contains references to literature on general organizational problems and ndividual fields of study, such as meteorology, geomagnetism, auroras and air glow, ionosphere, neteors, solar activity, cosmic rays, glaciology, oceanography, seismology and gravimetry. Papers dealing with activities of complex Antarctic (117) and Arctic expeditions (16) are listed eparately. Most of the material is annotated, and it is arranged by years and alphabetically within each year and division. *Subject Heading:* **1. Bibliography of Soviet meteorological terature.**—*A.M.P.*

10.9–77 550.3:019.941(05)

Sheĭnis, I. M., **O Referativnom Zhurnale.** [On the Referativnyĭ Zhurnal (Abstract ournal).] *Meteorologiia i Gidrologiia,* 7:56–57, July **1957. DWB, DLC**—The "Geografiia" f the **Referativnyĭ Zhurnal** contains abstracts of meteorological, hydrological and oceanographic apers. In addition, the part **Mekhanika** contains sections on Dynamic meteorology, Hyraulics of open channels and Filtration of fluids, etc. **Astronomiia** contains references to tmospheric optics. Since 1957 a special part, **Geofizika,** contains sections on Physics of the tmosphere, Physics of the hydrosphere and Physics of the earth; in these sections the same roblems are considered as those in the section Meteorology and climatology, Hydrology of the nd and Oceanography of the part **Geografiia.** The value of such overlapping is discussed. *ubject Headings:* **1. Referativnyĭ Zhurnal 2. Meteorological abstracts 3. Geophysics bstracts.**—*I.L.D.*

10.9–78 019.941

National Federation of Abstracting Services. *Science,* Wash., D. C., 127(3295):393, Feb. 1, 1958. **DLC**—A three-day meeting in Philadelphia, Feb. 1958, gave birth to the National ederation of Science Abstracting and Indexing Services. Biological Abstracts, the National cience Foundation and representatives of six scientific organizations made this new federation ossible. Detlev W. Bronk, president of the Rockefeller Institute and president of the lational Academy of Sciences, opened the conference. The objective of the new federation to improve the documentation of the scientific and technological literature of the world. *ubject Headings:* **1. Abstracting 2. Federation of abstracting services.**—*N.N.*

PRACTICAL AND APPLIED METEOROLOGY

OCEANOGRAPHY AND MARINE METEOROLOGY

See also: **Marine met. text** (Gładysz), 10.9–14; **Soviet marine atlas** (Isakov et al.), 10.9–31; **Marine obs. manuals, U.S.S.R.**, 10.9–33; **IGY and Woods Hole Oceanog. Inst.**, 10.9–43; **IGY oceanog. program, N. Atlantic** (Bückmann), 10.9–46; **Argentine Antarctic Exped., 1955–56** (Díaz), 10.9–58; **Sea ice strength** (Anderson), 10.9–90; **Sea ice distrib., Hokkaido** (Kawakami), 10.9–91; **Optical properties of river water, U.S.S.R.** (Bukina), 10.9–97; **Temp. gradient, N. Atlantic** (Houghton), 10.9 127; **Hurricane and cyclone waves, Gulf of Alaska** (Burt), 10.9–198; **Wind eff. on sea level, Atlantic City** (Miller), 10.9–228; **Swell frequencies, Morocco** (Simonet, Tanguy), 10.9–229; **Wind and sea waves, Caspian Sea** (Vilenskiĭ, Glukhovskiĭ), 10.9–233; **Saturation vapor press. of sea water** (Miyake), 10.9–241.

10.9–79 551.46

Deacon, George Edward Raven, **Physics of the oceans.** *The Times Science Review* London, (No. 23?), Spring **1957.** [8] p. fig., photos. Reprinted in *National Institute o Oceanography, Wormley, England, Collected Reprints*, 5(183), **1957.**—Practical reasons fo studying the oceans, to obtain more knowledge of movements, storm surges, currents and dis posal of effluents and waste materials, particularly those from atomic sources, are mounting rapidly. There is also a growing need for meteorologists to know more about the seasonal an regional transfer of heat and water vapor from the oceans to the atmosphere, and for scientist who deal with fisheries to understand changes in currents and general water circulation whic influence the productivity of special oceanic regions. Fortunately the increasing use of moder physical ideas and techniques to measure water movements has made it easier to apply th underlying laws of physics to the oceans. There are two requirements for progress: to mak measurements, often in difficult conditions, where observation in the past has been mainl qualitative; and to view the movements and changes measured as the results of experiment which, for their proper interpretation, call at least on the theories of statistics, fluid dynamics and heat transfer. The most important development since the war has been the bringin together of these approaches. Each has need of the other: for measurements blindly pursue lead only to tables; and theory, unrelated to measurement, lacks the stimulus to develop From this combination of approaches, still recent, the infinite variety of conditions found in th oceans now begins to make more sense. *Subject Headings:* **1. Physical oceanography 2. Ocean atmosphere interaction 3. Problems in oceanography.**—*Author's abstract.*

10.9–80 551.461.2:525.6:551.461.01

Oceanographic island observatory in Iceland. *American Geophysical Union, Transaction* 38(6):1019–1021, Dec. **1957. DWB**—Opinions differ as to the actual mean sea level in th Northern and Southern Hemispheres. The problem of distinguishing between the ma changes and the volumetric changes has created one of the difficulties of computing mean se level data from tide gage records. A method of removing this problem is discussed. Th location of many new tide gage stations at islands and coastal areas previously devoid of suc instrumentation is considered a step in the broadening of the oceanographic program for diversity of studies. *Subject Headings:* **1. Sea level calculations 2. Tide gage data.**—*N.N.*

10.9–81 551.464:551.526.6(265/26

Cochrane, John D., **The frequency distribution of surface-water characteristics in th Pacific Ocean.** *Deep-Sea Research*, London, 4(1):45–53, Dec. **1956.** 3 figs., 2 tables, 9 re **DLC**—The frequency distributions of surface-water characteristics in the Pacific Ocean a presented in a series of temperature-salinity diagrams. The frequencies are estimated fro maps of mean surface temperature and salinity in February and August. Six two-dimension distributions are obtained, one each for February, August, and the year in the North Pacif and one for each of these periods in the South Pacific. Prominent features of the distributio are discussed. *Subject Headings:* **1. Salinity distribution 2. Sea surface temperature da 3. Pacific Ocean.**—*Author's abstract.*

10.9–82 551.556.8:551.465

Tareev, B. A., **Dreĭfovye techeniia v melkovodnom more pod deĭstviem peremennogo vo vremeni vetra.** [Drift currents in a shallow sea under the influence of variable winds.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 5:605–612, **1958.** 2 figs., 8 refs., 30 eqs. **DLC**—In the analysis of the influence of periodic or arbitrarily changing wind fields upon drift currents in shallow waters, the author sets up the problem for an infinite sea of constant depth h over whose surface a uniform wind, capable of arbitrarily altering in force and direction, blows from the moment $t=0$. Neglecting the Coriolis force, one writes the equation of motion for the x-axis $\frac{\partial u}{\partial t} = \frac{\partial}{\partial z}\left[\nu(z)\frac{\partial u}{\partial z}\right]$; the limiting and initial conditions have the form $\frac{\partial u}{\partial z} = \frac{T(t)}{\rho\nu}$ when $z=0$, $u=0$, when $z=h$; $u=(z,0)=u_0(z)$

$$\tilde{u}(z,t) = A\{[\sin\alpha(h-z)\operatorname{ch}\alpha(h-z)+\cos\alpha(h-z)\operatorname{sh}\alpha(h-z)]$$
$$\times[\cos\omega t\cos\alpha h\operatorname{ch}\alpha h+\sin\omega t\sin\alpha h\operatorname{sh}\alpha h]$$
$$+[\sin\alpha(h-z)\operatorname{ch}\alpha(h-z)-\cos\alpha(h-z)\operatorname{sh}\alpha(h-z)]$$
$$\times[\cos\omega t\sin\alpha h\operatorname{sh}\alpha h-\sin\omega t\cos\alpha h\operatorname{ch}\alpha h]\}$$

and

$$A=\frac{T_o}{\sqrt{2\rho\mu\omega}\,(\cos^2\alpha h\operatorname{ch}^2\alpha h+\sin^2\alpha h\operatorname{sh}^2\alpha h)} \quad \text{and} \quad \alpha=\sqrt{\frac{\omega}{2\nu}}.$$

Here u = constituent velocity along the x-axis; $\nu(z)$ = kinematic coefficient of turbulent viscosity, which depends upon the vertical coordinate z; ρ = constant (density of the fluid); $T(t)$ = tangential direction of wind along the x-axis. For a periodic solution this equation is written as $\frac{\partial\tilde{u}}{\partial t} = \nu\frac{\partial^2 u}{\partial z^2}$. Computed variations of velocity with depth and the tangential stress of the wind on the bottom are presented on graphs. By means of the equation of motion and $\nu=\nu(z)$, variation of turbulent exchange with depth, an expression is obtained giving the decrease of the coefficient of turbulent exchange with depth up to a small value near the bottom, described by an empirical parameter (ϵ). The final solution of the equation is presented as

$$u(y,t)=\frac{1}{2\pi(h+\epsilon)\rho}\sum_{n=0}^{\infty}\frac{\pi b^2 R_n(b)-a^2}{\|R_n\|^2}\int_0^t \exp\left[-\nu_0\lambda^2{}_n(t-\tau)\right]T(\tau)d\tau R_n(y).$$

Subject Headings: **1. Wind field above the ocean 2. Wind effects on currents 3. Turbulent exchange coefficients.**—*I.L.D.*

10.9–83 551.46.018

Burkov, V. A. and Bogdanov, K. M., **Kratkovremennye avtonomnye stantsii nabliudenii nad techeniiami.** [Temporary independent stations for recording currents.] *Meteorologiia i Gidrologiia*, Leningrad, No. 10:37–39, Oct. **1957.** 4 figs., ref. **DWB, DLC**—The authors describe a method for setting up and using temporary independent stations for making observations in strong currents at depths exceeding 100 m. The apparatus consists of an automatic current recorder, two supporting buoys at the surface, spar buoys with angular reflectors, a cable, bottom anchor, anchor rings and clamps. Diagrams illustrating the installation of the device in strong and weak currents, at depths up to 500 m, and greater than 500 m, are presented, and the ways for insuring that the device remain stable in a horizontal and vertical direction are described. *Subject Heading:* **1. Current meters.**—*I.L.D.*

10.9–84 532.59:551.46:061(262)

Bossolasco, Mario; Dagnino, Ignazio (*both, Genoa. Univ. Ist. Geog. e Geod.*) and Sizzi, Giocondo (*Livorno. Oss. Meteor. e Sismico*), **La stazione registratrice del moto ondoso marino di Livorno.** [A station for recording the wave movements of the sea at Leghorn.] *Ricerca Scientifica*, Rome, 28(9):1847–1850, Sept. **1958.** 2 figs., 3 refs. French, English and German summaries p. 1850.—A station for recording of wave movements of the sea operates continuously since September 1957 at Leghorn. Together with the similar stations of Genoa-Pra

and Saint Tropez (France) this installation permits one to follow the origin and transformation processes of wave movement in the Ligurian Sea. The Leghorn station here described has been recently completed with an installation for the permanent recording of sea water temperature and of some local meteorological factors. *Subject Headings:* **1. Sea wave recording stations 2. Ligurian Sea 3. Leghorn, Italy.**—*Authors' abstract.*

10.9–85 532.59:551.46

Barber, N. and Doyle, D., **A method of recording the direction of travel of ocean swell.** *Deep-Sea Research*, London, 3(3):206–213, April **1956.** 8 figs., 4 refs. **DLC**—Wave detectors set in shallow water near a coast can reveal the direction of travel of swell in the deep water providing that the underwater contours of the coast are straight and parallel. Two detectors are sufficient provided that swell of any one periodicity has only one dominant direction of travel. *Subject Heading:* **1. Ocean swell travel direction.**—*Authors' abstract.*

10.9–86 551.556:532.59:551.46

Rattray, Maurice, Jr. and Burt, Wayne V., **A comparison of methods for forecasting wave generation.** *Deep-Sea Research*, London, 3(2):140–144, Feb. **1956.** 2 figs., 10 refs. **DLC**—Wave heights and periods in the generating areas of an unusually severe storm and its forerunner were hindcast by three different methods and compared with observations. Wave height agreement was good for all methods. Period agreement was poor; however, all reported periods fell within the spectral range determined by the Pierson-Neumann-James method. The description of a sea in terms of its spectrum is indicated. *Subject Headings:* **1. Ocean wave generation 2. Wave forecasting.**—*Authors' abstract.*

10.9–87 535.241:551.463

Clarke, George L. and Backus, Richard H., **Measurements of light penetration in relation to vertical migration and records of luminescence of deep-sea animals.** *Deep-Sea Research*, London, 4(1):1–14, Dec. **1956.** 11 figs., 27 refs. **DLC**—Direct measurements of the intensity of light at the levels of certain deep scattering layers were made using a bathyphotometer capable of responding to illumination as low as $10^{-7}\mu w/cm^2$ or about 10^{-12} of full sunlight. The vertical migration of the scattering layers was recorded by means of an echo sounder. During the middle of the day a single scattering layer was found and the top of this remained below the $0.01\text{-}\mu w/cm^2$ isolume. In the late afternoon the layer split into two and both parts rose more rapidly than the isolumes with the result that at sunset the top of the upper light intensity were thus involved in the vertical migration of these layers. Flashes from luminescent animals detected by the bathyphotometer were recorded on a Brush pen recorder. The intensity and frequency of luminescent flashes varied greatly with depth and with time and presented differing patterns in coastal and slope waters. *Subject Headings:* **1. Light penetration in deep water 2. Light intensities 3. Luminescence of deep sea animals.**—*Authors' abstract*

SEA ICE

10.9–88 551.311.1(714)

Robitaille, B., **A preliminary report on ice conditions at Cacouna Island, Quebec.** *Canada Dept. of Mines and Technical Surveys. Geographical Branch, Geographical Paper*, No. 10, **1957.** 24 p. 4 figs., 4 photos., 13 refs. Price: $.50. T.-p. and text in English and French.—Climatic, wind and tidal conditions contributing to ice conditions in the Cacouna Island, Quebec, region are outlined and illustrated with detailed maps and wind diagrams, and photos. *Subject Headings:* **1. Ice conditions in gulfs 2. Cacouna Island, Quebec.**—*M.R.*

10.9–89 551.311.184:518.

Agureev, S. P., **Nomogrammy dlia obrabotki nabliudenii za dreĭfom l'dov.** [Nomograms for working up observations on ice drift.] *Meteorologiia i Gidrologiia*, Leningrad, No. 1:54–5[illegible] **1958.** fig., 2 eqs. **DWB, DLC.** Transl. into English by David Kraus issued by American Meteorological Society under Contract AF 19(604)-1936, Oct. **1958.** 3 p.—The essence of the method for obtaining numerous observations on the drift of ice by means of observations with a single theodolite from the shore is in the determination of the position of the ice floe by

means of a horizontal vertical angle measured with a theodolite. The calculation of the position is speeded up by using a special plane table with a nomogram described by the author. The plane table is divided into squares by horizontal and vertical lines in order to find the distance to the ice floes and their speed. A grid is placed upon the plane table in the form of semi-circles in a scale of 1:10,000. From the center of the semicircle designating the position of the theodolite radiate lines forming a grid of horizontal angles. The horizontal diameter of the semi-circle is the abscissa and its vertical radius is the ordinate of a right angle system of coordinates on which a system of hyperbolic curves are drawn. The equation of the curves is $D=H+h/tg\varphi$, where H=height of the mark of the theodolite tube, D=distance to the ice floe, h=mark of water level at moment of observation and φ=vertical angle. The direction of the drift of the ice floe (N) is determined as the sum of the azimuth angle A and ∂=angle between the azimuth A and direction of the path S, namely $N=A+\partial$. An illustration of the nomogram is presented. *Subject Headings:* **1. Ice drift calculations 2. Ice drift nomograms.** —*I.L.D.*

10.9–90 551.311.181:551.464

Anderson, Don L. (*GRD, A.F. Camb. Res. Center, Mass.*) and Weeks, Wilford F. (*Washington Univ., Missouri*), **A theoretical analysis of sea-ice strength.** *American Geophysical Union, Transactions*, 39(4):632–640, Aug. **1958.** 9 figs., 15 refs., 11 eqs. **DWB, DLC**—For the first time an attempt is made to derive a theoretical relationship between sea ice strength and the controlling factors of salinity, temperature, and density. A geometric model of the ice brine relationship is constructed from photographs and used to calculate tensile strength of warm (above −20°C) sea ice. The theoretical results compare well with experimental data. The model developed can be extended to colder temperatures by considering the effect of solid salts. *Subject Headings:* **1. Sea ice strength 2. Sea ice strength—salinity relationships.**—*Authors' abstract.*

10.9–91 551.311.18(524)

Kawakami, Kiyoshi (*Japanese Hydrographic Office*), **Sea ice on the coast of Hokkaido Dec. 1955–April 1956.** *Japan. Maritime Safety Board, Tokyo, Hydrographic Bulletin*, No. 55:18–28, March **1958.** 4 figs., 8 photos, 9 tables. In Japanese; English summary p. 18. **DWB**—This is the summary of the result of sea ice condition along the coast of Hokkaido from Dec. 1955 to April 1956, from surveys conducted by the Hydrographic Division, 1st Regional MSB Hqs with coordination of maritime safety stations, lighthouses and patrol vessels. The condition of sea ice is as shown in tables and a figure. Other important data are as follows: a) The winter season during the period was rather mild and the cold number for the area was as follows: Omu with 471.7 was the highest followed by Kitami-Esasi with 423.0. Other areas of importance were Abasiri with 387.8, Kusiro with 326.7 and Nemuro with 228.8. b) The sea ice started to form in mid Jan. 1956; however it was not until the end of Feb. that it became fully developed. Early in March drift ice originated in the northern Okhotsk Sea, drifted to the coast of Hokkaido and remained until the middle of April. It is believed that this phenomenon was due to the result of low pressure in March which continually flowed toward N.W. along the southern coast of the Tisima Islands. c) The period of fast ice was 135 days at Nemuro (being the longest), followed by 124 days at Abasiri. However Nemuro with 102 days and Notoro with 93 days had actually the most days of fast ice. The period of drift ice was 110 days at Notoro (being the longest), followed by 88 days at Abasiri. However Notoro with 95 days and Abasiri with 73 days had actually the most days of drift ice. d) The ports and sea routes between Osidomari and Kusiro via Abasiri were impeded by sea ice for a period extending anywhere from 33 to 108 days. However, the actual days when the sea ice impeded the sea lane were from 2 to 83 days. The number of fishing boats reported in distress due to sea ice was 26. *Subject Headings:* **1. Sea ice conditions 2. Drift ice 3. Sea ice distribution 4. Hokkaido, Japan.**—*Author's abstract.*

10.9–92 551.311.18:656.61(265.3)

*Japan Meteorological Agency, **Sea ice report of Japan.** Its *Memoirs*, 40(1), **1958.** 128 p. figs., photos, charts, tables. In Japanese; English summaries. **DWB**—Sea ice observation off the Okhotsk coast of Japan in 1957 was carried out by the Sapporo district meteorological

observatory, Hakodate marine meteorological observatory and the northern district headquarters of the Japanese ground defense force from Jan.–April with patrolling ships and planes. Aerial photographs of panoramic views of sea ice conditions in Monbetsu and Abashiri harbors and photos of various types of sea ice are given. The report contained the following: 1) Visual observations by aircraft and ships; 2) Sea ice conditions of the southwestern region of the Okhotsk Sea surveyed by nonvertical (oblique) aerial photography from Jan.–April, 1957; 3) Summary of sea ice conditions observed from coastal weather stations and 4) (a) relation between oceanographical conditions and sea ice in the Okhotsk Sea, (b) synoptic sea ice charts of the U.S.S.R., (c) movements of ice-edges of the southern Okhotsk coast in thawing period (1956), (d) forecasting of the initial arrival date of drift ice from coastal records. Sea ice period of the Okhotsk coast of Hokkaido in 1957 was from Dec. 26–April 20 with drifting speed of 1/50 to 1/20 of wind speed. Sea ice distribution charts, graphs of variation of air temperature, oblique photos of sea ice distribution, tabulation of sea ice conditions at the coastal stations and synoptic charts of sea ice in Soviet section of Okhotsk Sea are given. *Subject Headings:* **1. Sea ice reports 2. Okhotsk Sea.**—*J. Woo.*

GLACIOLOGY

See also: **Glacial deposits, Searles Lake, Calif.** (Flint, Gale), 10.9–294.

10.9–93 551.311.1:551.5(481,485)

†*Eriksson, Backa Erik, **Glaciological investigations in Jotunheimen and Sarek in the years 1955 to 1957.** *Uppsala. Universitet. Geografiska Institutionen, Geographica*, No. 34, **1958.** 208 p. 81 figs., 36+18 tables, bibliog. p. 205–208. **DLC, DWB** (551.31 E78gL)—This large monograph contains 3 major parts: I. Geomorphological, II. Meteorological (p. 65–126), and III. Glaciological (p. 127–165), plus extensive tables of temp., humidity, wind, cloud, fog, precip. and other data at different places or levels (p. 167–203), and a thorough list of references to works on glacial ablation, heat balance and meteorology. Excellent photographs, diagrams, statistical tables and charts are presented to illustrate the current and comparative data for past years. Precip. and temp. records from 1876–1954 are shown graphically for Skagastöl Glacier (from Lärdal records) and it is evident that the present warming and recession trend began in 1901 after many years of heavy precip. Data for the Mika Glacier, Sarek, Swedish Lappland obtained in the summer of 1956 are presented graphically and discussed. Wind profiles for 100, 300 and 900 cm and for 25, 100 and 300 cm are plotted for clear, and for overcast weather during day and night, respectively, and smoke drift experiments were made to study the glacial winds. Temperature inversions were also studied and the eddy viscosity during calm winds and inversions in summer was found to be below any values found in the literature. The temp. depression on Sarek was 3.8°C (average), compared with 3.3°C on Skagastöl Glacier. The local glacier wind was found to reach 4 to 5 m. Influence of prevailing winds on glacio-morphology is also treated analytically, with conclusion that mountain glaciation is initiated in a direction to leeward of prevailing winds. *Subject Headings:* **1. Glaciological expeditions 2. Glacio-meteorological surveys 3. Glacial retreat 4. Warming of Arctic 5. Skagastöl Glacier, Jotunheimen, Norway 6. Mika Glacier, Sarek, Sweden.**—*M.R.*

10.9–94 551.311.12(485

†Johnsson, Gunnar, **Glacialmorfologiska studier i södra Sverige, med särskild hänsyn till glaciala riktningselement och periglaciala frostfenomen.** [Glacial morphology in southern Sweden, with special reference to glacial orientation elements and periglacial frostphenomena.] *Lund. Universitet. Geografiska Institutionen, Medelanden, Avhandlingar*, No. 30 (i.e. 31), 1956. 407 p. 266 figs. and photos, bibliog. p. 395–407. English summary p. 376–393. Thesis (Ph.D.)—Lund. Univ. **DLC** (QE697.J53). Review by John Leighly in *Geographical Review* N. Y., 48(1):144–146, Jan. **1958.**—This comprehensive work is based on author's theoretical and field studies 1948–1954 and was presented as his Ph.D. thesis. The glacial-morphological problems discussed emphasize the extent and application of various glacial elements, reconstruction of ice movements and ice melting, keeping in mind that the regional interpretation is always dependent on the method. The periglacial frost phenomena are investigated b

LJUNGNER's method, including rock analysis. The main chapters are: Glacial-morphological problems in southern Sweden; the concept "orientation element"; the periglacial cryoturbate forms; Swedish periglacial terminology; Ljungner's rock analysis; major glacial forms in southern Sweden; roches moutonnées (round-rock-formation); glaciscultptural orientation elements; nonorientated glaciscultptural form elements; ice movements (Gothenburg area); sedimentation relationships between NE-ice and young Baltic ice at Lund; ice wedges in the Saxtorp delta; morphology of the west Scanian moraine cliffs, including the climate during the final glaciation, according to the periglacial frost phenomena, etc. *Subject Headings:* **1. Glacial morphology 2. Cryoturbate phenomena 3. Southern Sweden.**—*W.N.*

10.9–95 551.311.1

Jaffe, A. (*Inst. f. Met. und Geophysik, Innsbruck Univ.*), **Aus der neueren Alpen-Gletscherforschung.** [Recent Alpine glacial research.] Reprint of 2 p. from *Die Pyramide*, Berlin, No. 9/10, Oct. **1957. DWB** (Reprint file). Also issued as *Innsbruck. Universität. Institut für Meteorologie und Geophysik, Publikation*, No. 55. **DWB**—Research on Alpine glaciers has been pursued along 3 lines: 1) Climatology of the higher Alpine regions (2000–3700 m), 2) microclimatology of air lying directly over the ice and snow and 3) the mechanics of ice movement. Swiss and Austrian workers include HOINKES, SAUBERER, DIRMHIRN, THAMS, AMBACH and others. Radiation, precipitation, runoff, heat exchange during snow melt, wind and temperature, albedo of ice and snow, radiation in ice, structure of glaciers and firn, ablation, difference between Polar and Alpine glaciers, research conditions and methods, etc. are reviewed. *Subject Headings:* **1. Alpine glacier research 2. Glacier research 3. Eastern Alps.**—*M.R.*

10.9–96 551.311.13

Blumenthal, Moritz M. (*Locarno-Ankara*), **Die Vergletscherung des Ararat (nordöstliche Turkei).** [Glaciation of Ararat (northeastern Turkey).] *Schweizerische Naturforschende Gesellschaft, Verhandlungen*, 136:176–178, **1956. DWB, DLC**—A description of the geographic-geological position of Ararat and of its morphological and genetic features is followed by an account of the recent and diluvial glaciation, and of the regeneration glacier of Cehennem Dere. Some 10–11 slope glaciers, 1–1½ km long, terminating at 3800–3900 m emerge from the crater region. The diluvial glaciation is not indicated by low lying moraine deposits. The area of diluvial glaciation is estimated at about 102 km² (the present ice and firn area is 10–13 km²). The glaciers descending along the northern slope from the crater area form a regeneration glacier, about 3½ km long, descending into the Cehennem Valley. A description of the glacier and the associated moraines plant life is presented. *Subject Headings:* **1. Glaciation 2. Ararat, Turkey.**—*I.L.D.*

LIMNOLOGY AND HYDROGRAPHY

See also: **Limnological obs. manuals, U.S.S.R.,** 10.9–32; **Irrig. effects of river flow, Syr Darya River, U.S.S.R.** (Kuznetsov), 10.9–278; **Maximum river discharge** (Malik), 10.9–280; **Flood hydrographs, Tvertsa River, U.S.S.R.** (Miliukova), 10.9–281; **Radiocarbon dating, Searles Lake, Calif.** (Flint, Gale), 10.9–294.

10.9–97 535:551.482 535:551.463

Bukina, L. A., **O svetovom rezhime rek Rion, Kuban' i Don.** [Light regime of the Rion, Kuban' and Don Rivers.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, 9:1194–1200, **1957.** figs., 5 tables, 10 refs., 5 eqs. **DWB**—Several Soviet studies on the optical properties of ver and sea water are summarized briefly. This is followed by an account of an investigation f the attenuation of daylight at different depths in rivers differing in the amount and con-itution of their loads. The optical density $D=\ln(Iu/I)$ was measured at various depths of nese rivers by means of a photometer whose construction is described with the aid of a diagram nd a photograph. It is shown that the coefficient of attenuation $k^*(k^*=kC$ where $=0.43\pi\Sigma a_i^2 N_i$ and C=concentration of suspended particles in water) differs for all the rivers nd the dependence of optical density upon depth is linear. This indicates that either changes f the fractional content of suspended particles in water and their concentration are so inter-lated that K^* is constant or that the fractional content does not vary with depth. The sults of an analysis of the load content of these rivers is that small fractions predominate in

the Rion and Kuban' Rivers, the Rion having one and one-half times as much small fractions as the Kuban'. This accounts for the greater light extinction in the Rion although the mean turbidity is less than that of the Kuban'. In order to verify the applicability of individual formulas of wave and geometrical optics to river loads, coefficients of attenuation obtained by measurements at different depths were compared with those calculated from granulometric analysis ($k = 0 \cdot 43\pi\Sigma a_i^2 N_i$). The systematic differences between these are discussed. *Subject Headings:* **1. Optical properties of river water 2. Optical properties of sea water 3. U.S.S.R.** —*I.L.D.*

10.9–98 532.54

Franke, P. G. (*Unesco Expert, College of Eng., Poona*), **Frictional losses of head in steady uniform flow.** *Journal of Scientific and Industrial Research, Sec. B*, New Delhi, 17(8):289–296, Aug. **1958.** 4 figs., 7 tables, 13 refs., 30 eqs. **DWB, DLC**—The known equations for the flow of liquids under stream line and turbulent conditions have been discussed and the application of equations, developed by VON KÁRMÁN-PRANDTL, WHITE-COLEBROOK and SUPINO for determining the coefficient of resistance, when fluids flow under pressure through pipes and galleries, is explained. Based on the analogy of partly filled lines of circular cross-sections, formulas for flow in open channels are derived. A table of exponents used in these formulae is presented. Recent researches in the field have been reviewed and further lines of work are indicated. *Subject Headings:* **1. Fluid flow 2. Flow in open channels.**—*Author's abstract.*

10.9–99 536.22:551.481.1

†Schmitz, H. P., **Über die Abkühlung von Binnenseen.** [Cooling of lakes.] *Acta Hydrophysica*, Berlin, 1(1):7–30, **1953.** 3 figs., 34 refs., 65 eqs. German summary p. 7. **DLC**—The classical equations for turbulent heat transfer in water are criticized since they ignore the temperature dependency of density. Especially near 4°C and during warming up periods more complicated relations have to be considered. A one-dimensional treatment shows the laws governing the convection depth during cooling. Specific cases include the formation of a discontinuity and also the nocturnal diminishing of the temperature gradient. A differential equation is developed for the cooling of a water column between 4 and 0°C and solutions are presented for varying initial and boundary conditions. *Subject Headings:* **1. Turbulent heat transfer in water 2. Cooling of water bodies 3. Lakes.**—*A.A.*

10.9–100 628.13(237)(71

Kennedy, Howard, **Water conservation studies on the east slopes of the Rocky Mountains.** *Royal Society of Canada, Transactions*, Ser. 3, 51(4):53–62, June **1957.** fig. **DLC**—Reference is made to the Acts of Parliament which have given corporate life to the Eastern Rockies Forest Conservation Board, the reason for the Board's formation, and its terms of reference as applied to water conservation. The Board's approach to the problem is explained with the studies and surveys it has undertaken. The progress of these researches to date, the tentative conclusion drawn from them, and the future possibilities are dealt with. *Subject Headings:* **1. Water conservation 2. Eastern Rocky Mountains, Canada.**—*Author's abstract.*

10.9–101 546.293:551.4

Oana, Shinya, **Bestimmung des Argons im besonderen Hinblick auf gelöste Gase in natürlichen Wässern.** [Determination of the argon, especially in regard to gases dissolved in natural waters.] *Nagoya, Japan. Univ. Institute of Earth Sciences, Journal*, 5(2):103–124 Sept. **1957.** 5 figs., 14 tables, 5 refs., eqs. **DWB**—A rapid and precise method for determining argon in gaseous mixtures was devised. All gases other than rare gases are fixed with calcium by vaporizing a piece of that metal in a combustion tube. The percentage of argon can be calculated from pressure values before and after the experiment. The amounts of the other rare gases are negligible. The results show that the argon value of 0.93% for the atmospheric air, which has been reported by previous investigators, is somewhat large. 0.917% is my corrected value. Also the values of argon solubility in water must be revised. The result from natural waters showed: 1) The quantity of argon dissolved in surface water, which is in gas exchange equilibrium with the atmospheric air, varies with temperature, and shows a wide seasonal variation, particularly in the temperate zone, with a maximum in winter and a min

mum in summer. 2) Ground water shows also seasonal variations with phases different from surface water from which the movement of ground water can be computed. 3) The ratio of argon to nitrogen in water, which is in gas exchange equilibrium with the air, is definite for each temperature. Deviations from these theoretical values indicate at times the production and at other times the fixation of nitrogen. In this way it was proved that anaerobic ground water is usually enriched by nitrogen due to anaerobic denitrification. It is most remarkable that considerable denitrification occurs at upper levels of lake water where aerobic conditions predominate. *Subject Headings:* **1. Argon in gaseous mixtures 2. Argon solubility in water.**—*Author's abstract.*

10.9–102 551.482.212.3

Tsibik, I. V., **Ob izuchenii stoka vzveshennykh nanosov.** [The study of the flow of suspended silt.] *Meteorologiia i Gidrologiia*, No. 11:45–46, Nov. **1956. DWB, DLC**—In investigating the flow of suspensions in rivers during the summer-fall-winter period the following procedures should be followed: samples of sediments should be taken at the beginning of the rise and after the fall of the river; the samples for mechanical analysis of the suspended matter should be 5–10 liters during the rise peak and fall of the waters; when the turbidity is less than 50 g/m³ samples are not taken. In the case of very small rivers when the turbidity from summer floods may increase, individual samples of 1.0 liters should be taken and filtered daily and the filtrates measured. In rivers in which the flow of suspended matter has not been studied such samples should be taken over a period of several years. *Subject Heading:* **1. River silt suspension.**—*I.L.D.*

ASTRONAUTICS—SATELLITE OBSERVATORIES

See also: **IGY satellite program, 10.9–44; Satellite photog., 10.9–45.**

10.9–103 629.19

King-Hele, D. C. (*Royal Aircraft Estab., Farnborough*), **Progress of Sputnik 2, 1957β.** *Nature*, London, 181(4611):738–739, March 15, **1958.** fig., table. **DWB**—By March 1958 Sputnik 2 had circled the earth for more than four months. This paper gives a preliminary report on its progress round the earth. There is a marked change in the slope of the curve for the period Dec. 20 and Jan. 5 and several other smaller fluctuations in the slope. When Sputnik 2 began its career the orbit had an eccentricity of about 0.1 and the height varied between 120 and 900 naut mi. It was at perigee when going north at a latitude of about 51°N. By March 1958, the eccentricity had fallen to about 0.056 and the height varied between 110 and 520 naut mi. *Subject Heading:* **1. Satellite orbits.**—*N.N.*

10.9–104 551.507.362.2:551.510.535

Munro, G. H. and White, R. B. (*both, Radio Res. Lab., c/o Elect. Eng. Dept., Univ. of Sydney*), **Observations in Australia of radio transmission from the first artificial earth satellite.** *Nature*, London, 181(4602):104, Jan. 11, **1958.** 2 figs. **DWB**—The Radio Research Board in Australia has had a choice of 20 and 40 Mc/s for radio transmissions from the first Soviet satellite which has provided a new approach to the study of the ionosphere. In order to record the intensity variations of the signals from these satellites the Overseas Telecommunication Commission provided a low-noise site and good receiving facilities at Bringelly, near Sydney. This material tells how the observational procedures were carried out. *Subject Headings:* **1. Satellite tracking 2. Satellite ionospheric observation.**—*N.N.*

10.9–105 551.507.362.2

*Miczaika, G. R. and Wahl, E. W., **The orbital motion of the earth satellite 1957β from April 1 to its decay April 14, 1958.** Special Projects Lab., Geophysics Research Directorate, Air Force Cambridge Research Center, Air Research and Development Command, June 5, **1958.** 38 p. 6 figs., 2 tables. At head of t-p: Project Space Track. (AFCRC-TN-58-445). **DWB** (629.1388 M6269or)—The orbital motion of the Russian artificial earth satellite 1957β between 1 April 1958 and 14 April 1958, the day of its disintegration, is discussed. The analysis is based on all positional observations available to Project Space Track prior to 2

May 1958. These observations are listed in a catalog. Included in the study are descriptive reports on the decay phenomena as observed from ships and islands in the Caribbean Sea. Notes on the decay of the Russian satellite 1957α, as written in Dec. 1957 are added as a matter of record. *Subject Headings:* **1. Satellite orbits 2. Satellite observation.**—*Authors' abstract.*

10.9–106 629.19

Nielsen, Jack N.; Goodwin, Frederick K. and Mersman, William A. (*all, Ames Res. Center, Moffett Field, Calif.*), **Three-dimensional orbits of earth satellites, including effects of earth oblateness and atmospheric rotation.** *U. S. National Aeronautics and Space Administration, NASA Memorandum*, 12-4-58A, Dec. **1958.** 85 p. 12 figs., 3 tables, 15 refs., eqs. throughout. **DWB** (629.1388 U584me No. 12-4-58A)—Complete trajectories of earth satellites have been studied from outer space to the ground using automatic computation. Equations of motion based on an "instantaneous ellipse" method were found suitable for automatic computation up to the terminal phase of the trajectory. For the terminal phase, equations of motion using time as an independent variable were found more suitable. Several sample calculations were performed to study the effect of the earth's oblateness and the atmosphere's rotation on the motion and the point of impact. *Subject Heading:* **1. Satellite orbits.**—*NASA abstract.*

10.9–107 523 551.507.362.2 551.510.53

Pérard, A., **Les progrès récents de l'astronomie.** [Recent strides in astronomy.] *L'Astronomie*, Paris, 72(8)-303–310, July/Aug. **1958. DLC**—Brief account of the progress made in astronomy during the last few years. This progress is partly due to the launching of artificial satellites. The author then reviews the progress made in the study of the upper boundary of the lunar atmosphere, in the study of the solar system, meteorites, stellar evolution, scale of distances, and he reports on the progress in radio astronomy. *Subject Headings:* **1. Progress in astronomy 2. Satellites observatories 3. Outer atmosphere 4. Radio astronomy.**—*A. V.*

10.9–108 551.501:551.507.362.2

Telle, L., **Het Moonwatch Station Curaçao.** [The Curaçao Moonwatch Station.] *Hemel en Dampkring*, The Hague, 56(11):209–211, November **1958.** 4 photos. **DWB, DLC**—Twelve stations scattered over the world are equipped with special movable camera-telescopes in order to observe satellites. Among them, Curaçao is situated nearest to the equator (12°N and 69°W). Besides this station, a Moonwatch Station is set up in Curaçao, manned by amateurs and equipped with prism binoculars 7×50. It reports visual data quickly to the camera station and to the Smithsonian Institution. Equipment and activities of the Moonwatch Station are briefly described. *Subject Headings:* **1. Satellite observation 2. Curaçao Dutch West Indies.**—*A. V.*

AERONAUTICAL METEOROLOGY

See also: **Upper air climat., U.S.S.R.,** 10.9–26; **Safe flying through thunderstorms** (Voskanov et al.), 10.9–109.

10.9–109 551.515.4:629.1

Voskanov, A. I.; Imianitov, I. M.; Kulik, M. M. and Chuvaev, A. P., **O vozmozhnosti bezopasnogo prokhoda samoleta cherez grozovye zony.** [Possibility of safe flying through thunderstorm zones.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 67(129):114–120, **1957.** 5 figs., 2 tables, 9 refs. **DWB**—A method allowing airplanes to determine their approach to dangerous thunderstorm zones is described. It is based upon the fact that atmospheric electricity fields increase in magnitude on approaching thunderstorm clouds. The electrical structure of thunderstorm clouds and the distribution of electric fields near them are discussed and it is concluded that if the zone of the radar blob observed with a 3 cm radar includes the dangerous area of thunderstorm activity, the zone of increased electrical fields includes the zone of the radar blob. If an airplane, provided with a device indicating the magnitude of the electric field, is steered so as not to intersect any line of

given charge situated at a sufficient distance from the danger zone, the airplane can fly around the thunderstorm cloud at a safe distance. Diagrams illustrating such a flight, graphs showing the electrical field near and within thunderstorm clouds and numerical data of electrical field for various cumulus clouds, rain and hail are presented. *Subject Headings:* **1. Thunderstorm flights 2. Flight safety through thunderstorms.**—*I.L.D.*

10.9–110 551.574.7:629.13

§*Thompson, James K., **1954 icing presentation for major commands.** *U. S. Wright Air Development Center, Technical Note*, WCT 55-26, April **1955.** Pt. 1, **Introduction.** 5 p. Pt. 2, Thompson, James K.: **Operational aspects of the aircraft icing problem.** 18 p. 21 figs. (figs. and tables). Table of contents mentions Pt. 3–4, lacking in this copy. **DWB** (M74.7 T473ic)—Accounts of a number of typical military aircraft accidents due to icing; the preparation of icing reports, icing severity scales; speed altitude and temperature effects and limits to icing; aerodynamic (lift and drag) effects, icing forecasts, statistical analysis of icing and related meteorological data, synoptic case history of severe icing conditions, frost formation, types of icing (tabulated), photos of ice and freezing rain on aircraft, data on icing of various types of aircraft in relation to air temp. compared with Mt. Washington data on icing, (also graph showing relation to Mach number, as well as air temp. for jet and prop aircraft, respectively; altitude and severity of icing, weather types and icing severity are presented. *Subject Heading:* **1. Icing of aircraft studies.**—*M.R.*

10.9–111 551.5:629.135:656.08

Stewart, Oliver (*ed. of Aeronautics*), **Danger in the air.** N. Y., Philosophical Library, **1958.** 194 p. photos. Price: $6.00. **DLC** (TL553.5.S7)—This exciting account of a number of British aircraft accidents consists of detailed technical narratives of examples of many kinds of disasters and their causes (as deduced by official boards and as judged by the author—himself a veteran pilot). Accidents due to structural failure, a pilot error, imperfect instrumentation, inaccurate navigation charts, altimeter errors, wind effects at take off, squalls, navigational errors, sabotage, etc., and accidents to conventional airplanes, dirigibles, gliders, flying boats, jets and turbo-jet planes (Comet) are considered in separate chapters with the basic idea that discussion of such accidents leads to improvement in flying safety and great advances in aviation, even to changing the course of aviation history (as in the case of dirigibles or Comet disasters). The various accounts shed a great deal of light on the painstaking methods now employed to get at the bottom of the real causes of the accidents and thus to recommend measures for avoiding such accidents in the future. Weather or atmospheric effects enter into several of the accidents—the one at Kano Airport on June 24, 1956 (thunderstorm cell downdraft at end of runway during takeoff), for example. Three cases of icing of airframe and engines, and several cases where weather was a factor, although not considered the cause of the accident, are also mentioned. *Subject Headings:* **1. Aircraft accidents 2. Weather effects on aircraft accidents.**—*M.R.*

GEOMAGNETISM

10.9–112 539.19:523.75:550.385

Legrand, J. P., **Possibilités de prévision des phénomènes solaires et de leurs répercussions sur le globe par l'étude de l'intensité du rayonnement cosmique.** [Possibilities of forecasting solar phenomena and their effects on the earth through the study of cosmic radiation intensity.] *Académie des Sciences, Paris, Comptes Rendus*, 247(1):70–73, July **7, 1958.** 2 figs., 2 tables, 4 refs. **DLC**—The recordings of cosmic ray intensity made at Issy-les-Moulineaux from April 12, 1957 to March 31, 1958 made it possible to point out several cosmic ray storms. The author has noted that these storms were preceded by a falling out of the cosmic intensity level, ranging about 1 to 3% with regard to the normal level, and lasting from 3 to 5 days. This falling out, which the author calls a "start of pre-falling," is generally 24 to 48 hrs ahead of chromospheric eruptions followed by geomagnetic and ionospheric disturbances. This start of pre-falling coincides with the appearance of solar radioelectric activity or precedes it from 24 to 48 hrs. *Subject Headings:* **1. Cosmic ray intensities 2. Cosmic ray storms 3. Solar**

phenomena forecasting 4. Chromospheric eruptions 5. Geomagnetic ionospheric relationships 6. Issy-les-Moulineaux, France.—*A. V.*

10.9–113 550.386.6

***K*-Indices of geomagnetic activity from the observatories at Hartland, Eskdalemuir and Lerwick for July and August 1957.** *Journal of Atmospheric and Terrestrial Physics*, London, 11(3/4):303–304, **1957.** All tables. **DLC**—Three-hourly values beginning with 00–03 h and ending with 21–24 h are given for Hartland, Eskdalemuir and Lerwick observatories for each day of July and Aug., 1957. *Subject Headings:* **1. *K*-index 2. Geomagnetic data 3. Scotland.**—*M. R.*

10.9–114 550.384:550.380.23

Troitskaia, V. A., **Earth-current installations at the stations of the U.S.S.R.** *International Geophysical Year, 1957/1958 Annals*, Vol. 4:322–329, **1957.** 13 figs., table, 11 refs. **DWB**—Lists the 17 U.S.S.R. stations where the earth's electrical and magnetic fields and its characteristics of micropulsations were investigated during IGY. Five of these stations were in the Arctic, two were in the Antarctic. The paper contains methods of tracing some zonal and meridional chains at these stations as well as the description of the installations of the instruments and the methods of studying the major types of pulsations. *Subject Headings:* **1. Geomagnetic micropulsations 2. Geomagnetic field instruments 3. Earth currents 4. U.S.S.R.**—*N. N.*

10.9–115 550.385.26

Nagata, T. and Mizuno, H. (*both Geophysical Inst., Tokyo Univ.*), **S_q-field in the polar region on absolutely quiet days.** *Journal of Geomagnetism and Geoelectricity*, Kyoto, Japan, 7(3):69–74, Sept. **1955.** 6 figs., 10 refs., eqs. **DLC.** Reprinted as *Tokyo. Univ. Geophysical Institute, Geophysical Notes*, 9(1), Contribution No. 7, **1956. DLC**—It is proved by analyzing geomagnetic data on the quietest days during the Second Polar Year that the *S*-field over the whole surface of the earth on the absolutely quiet days which are defined as the days when $\Sigma K_P = 0$ can be well represented by the extension of the S_q-field which has been defined by Chapman for the interzonal region of the earth. The *S*-field on the absolutely quiet days defined here will be called the S_q°-fie d. *Subject Headings:* **1. Geomagnetic S_q-field 2. Solar-daily variations.**—*Authors' abstract.*

10.9–116 550.380.6/8

Zmuda, Alfred J. (*Johns Hopkins Univ., Baltimore*), **A method for analyzing values of the scalar magnetic intensity.** *Journal of Geophysical Research*, Wash., D. C., 63(3):477–490, Sept. **1958.** fig., table, 11 refs., 23 eqs. **DLC**—Various studies on the interaction between charged particles and the geomagnetic field indicate the existence of a source of magnetism located above the earth's surface. It is likely that for the near future, magnetic studies connected with the external source and with upper-air magnetic properties in general, will be conducted primarily with magnetometers measuring only the magnitude of the intensity not its direction. With this type of data, the customary methods of analysis are not applicable. An appropriate analytic method is treated which utilizes a series for the square of the scalar magnetic intensity. The terms of this series are obtained through the use of the series of spherical harmonics generally applied to each component of the intensity. Through an analysis of scalar intensity alone, the method yields the magnetic characteristics that are normally obtainable through a spherical harmonic analysis of the vector magnetic intensity. Also, the variation with altitude of the magnetic equator is treated in conjunction with the location of the equator for cosmic rays. *Subject Headings:* **1. Magnetometers 2. Magnetic data analysis.**—*Author's abstract.*

SEISMOLOGY

10.9–117 551.21:550.341.

Kizawa, T. (*Met. Research Institute*), **Earthquakes that occurred during the formation period of a new dome "Showa-Shinzan" and their forerunners near volcano Usu.** [A study of earthquakes in relation to volcanic activity, Pt. 1.] *Papers in Meteorology and Geophysics*

Tokyo, 8(2):150–169, July **1957.** 14 figs. (incl. photos), table, 33 refs., eqs. **DWB**—1) Daily frequency tables of earthquake swarms that occurred during the formation of Showa-Shinzan, one of the Pelée-type volcanoes, i.e. for the period of 23 months, were prepared, making use of the seismograms in Muroran, Mori and Sapporo ($\Delta = 25$ km$\sim$69 km); 2) These frequency curves clearly expressed the three stages: (a) prevolcanic, (b) eruptive activity and (c) birth and development of lava dome; 3) Striking coincidence between the development of earthquakes swarms and three stages of activity is shown and the important relations between them are explained; 4) The existence of forerunning earthquakes in Pelée-type volcanic activity (as in Volcano Usu) is clearly shown, and possibility of prediction of volcanic activity using seismological observations in a town of considerable distance from the volcano was suggested. *Subject Headings:* **1. Earthquakes 2. Volcanic eruptions 3. Japan.**—*Author's summary.*

10.9–118 550.34

Davis, T. Neil, **Preliminary report on the Alaskan earthquake of April 7, 1958.** *American Geophysical Union, Transactions,* 39(5):941–942, Oct. **1958.** fig. **DWB, DLC**—The Alaskan earthquake of the 05h 30m April 7, 1958 (150° WMT) is the largest (Richter scale 7.0–7.5) of a series of shocks centered in an area near Huslia, Alaska. Severe breakage of lake and river ice and many ground cracks and mud flows occurred in the region of the field epicenter. A preliminary isoseismal map is presented. *Subject Headings:* **1. Earthquakes 2. Alaska.** —*Author's abstract.*

10.9–119 532.5:550.34

Nishimura, Eiichi; Mikumo, Takeshi and Otsuka, Michio, **On anomalous time-distance curves observed in local earthquakes.** *Tellus,* Stockholm, 10(1):145-152, Feb. **1958.** 6 figs., table, 2 refs. **DWB, DLC**—The precise observations of local earthquakes were carried out in Wakayama District, Japan, for the purpose of studying the crustal structure and the nature of local shocks. The travel-time anomalies were detected, and the anomalous time-distance curves were separable into two groups which seemed to be related with the directions of the initial motion of shocks recorded at their respective stations. The causes of the travel-time anomalies may reasonably be attributed to the condition of the hypocenter and mechanism of earthquake occurrence. *Subject Heading:* **1. Seismic waves.**—*Authors' abstract.*

10.9–120 550.34(522.2)

Kurebayashi, H., **On the earthquake at Nagasaki.** *Journal of Meteorological Research,* Tokyo, 9(8):600–601, Aug. **1957.** 2 figs. **DWB**—Statistical surveys of earthquakes in Nagasaki Prefecture observed by Nagasaki station and marine meteorological observatory are reviewed. 1007 felt earthquakes had been recorded in Nagasaki from 1879–1955. The frequencies (of occurrence) of unfelt and felt earthquakes having their epicenters between Shimahara peninsula and the sea of Amakusa from 1880–1955 are graphed. *Subject Headings:* **1. Earthquakes 2. Nagasaki, Japan.**—*J. H. Woo.*

GEODESY

See also: **Advances in geodesy** (Hirvonen), 10.9–22.

10.9–121 526.3

Whitten, Charles A., **Distortion in continental triangulation.** *American Geophysical Union, Transactions,* 39(5):819–820, Oct. **1958.** 2 refs. **DWB, DLC**—The present network of triangulation in the U. S. is the result of adding individual surveys season by season to the existing framework. The last major readjustment of the national net was in 1927. The skeleton framework of that date is now covered by criss-crossing arcs and area nets of first— and modified second—order triangulation. When each survey is mathematically adjusted to be consistent with the previously adjusted surveys, small twists and strains are introduced. These tend to accumulate through successive adjustments to a point where observations are distorted far beyond normal expected errors. Efforts are made to keep this distortion to a minimum by increasing standards of accuracy for the basic framework and by planning surveys to give strength to the net as well as furnishing desired information for engineering and

scientific projects. Methods of computation which will give complete information on internal accuracy and checks must be used. Also, through the application of modern electronic computing equipment, it is possible to adjust the maximum size net, thereby reducing probability of extreme distortion. *Subject Heading:* **1. Triangulation.**—*Author's abstract.*

10.9–122 526

Bragard, L., **La masse de la terre et sa densité moyenne.** [The mass of the earth and its average density.] *Société Royale des Sciences de Liége, Bulletin*, 26(6):290–294, June 20, **1957.** 6 refs. **DLC**—When expanding POINCARÉ's equation of the total mass, enlarged to the case of a bearing surface (geoid) partially covered with masses (topographic relief), the mass of the Earth is expressed on account of the oblateness of the international ellipsoid used in geodesy and of two constants. Its value is calculated, and from it can be derived the value of the average density. The results obtained confirm those of the Celestial mechanics. *Subject Heading:* **1. Earth's mass.**—*A. V.*

10.9–123 550.36(24)

Machado, Frederico, **Compressibility and temperature of the earth's interior.** *American Geophysical Union, Transactions*, 39(5):943–946, Oct. **1958.** 3 figs., 4 tables, 13 refs., 4 eqs. **DWB, DLC**—With a few assumptions regarding the constitution of the earth's mantle and core, and using the values of pressure, density, and compressibility given by BULLEN, the melting points at various depths were derived by UFFEN's method. Assuming for the liquid core an adiabatic gradient, it seems that in the adopted Earth model the temperature of the lower mantle (below 800 km depth) is close to the melting point of the respective material and its strength is therefore much reduced. On the contrary the temperature of the upper mantle (depths 200 to 600 km) is considerably below the melting point and the material certainly has enough strength to permit the strain accumulation necessary to produce plutonic earthquakes. *Subject Heading:* **1. Earth's interior.**—*Author's abstract.*

AGRICULTURAL METEOROLOGY

See: **Agromet. texts., U.S.S.R.** (Ventskevich), 10.9–7.

FOREST METEOROLOGY AND FIRE WEATHER

See: **Forest infl. on flood discharge** (Ivanov), 10.9–276.

MEDICAL METEOROLOGY

See: **Bioclimat., Soviet Arctic** (Danishevskiĭ), 10.9–24.

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION

See also: **Observers' manuals, U.S.S.R.,** 10.9–32; **Marine obs. manuals, U.S.S.R.,** 10.9 33; **Pilot balloon data computations, U.S.S.R.,** 10.9–34; **Punched card manuals,** 10.9–37; **Weather stations, Antarctica** (Rusin), 10.9–62; **Satellite obs., Curaçao** (Telle), 10.9–108; **Ionospheric meas. tech.** (Silberstein), 10.9–173; **Cloud height meas.** (Chestnaia), 10.9–256; **Analog and flood routing computers** (Kohler), 10.9–277; **Auroral absorption meas. techniques** (Lied), 10.9–316.

10.9–124 551.501.

Atonen, A. and Khobta, P. M., **Dva mneniia o blankakh "TD" dlia stantsiĭ i postov** [Two opinions on the "TD" forms for stations and posts.] *Meteorologiia i Gidrologiia* Leningrad, No. 1:51–52, **1958. DWB, DLC**—The new TD form for recording technica station operations simplified and systematized the technical station records. It contains

however, several defects (according to ATONEN), namely: a repetition of the record of ice conditions, insufficient room for recording runoff data, etc. KHOBTA criticizes the present record blanks as requiring a duplication of work and outlines a form for efficient and complete recording of observational data. *Subject Heading:* **1. Station records.**—*I.L.D.*

10.9–125 551.501.7:551.510.42

Gelman, Charles (*Special Air Pollution Study of Louisville & Jefferson County, Kentucky*), **Estimation of water soluble chlorides, sulphates, and nitrates in suspended atmospheric dusts.** *Air Pollution Control Association, Journal*, 7(3):216–219, Nov. **1957.** 3 figs., 3 tables, 15 refs. **DWB, DLC**—This article presents a new method that has been adopted in Louisville, Ky. for about 6 mo in order to determine the amount of water soluble chlorides, sulphates, and nitrates in the suspended dust particles in the air. The procedures adopted for the extraction of water inorganics as well as those for nitrate estimation reagents are cited. Tables are provided for the different methods. Nitrate estimation is accurate within 2–5% in the range of 2–75 mg./l. in 1 ml. of water extract. This is a satisfactory accuracy. The procedures outlined here are simple enough to be followed by even the non-professional personnel. *Subject Heading:* **1. Atmospheric pollution measurement.**—*N.N.*

10.9–126 551.501:551.557.2:532.72

*Hilst, Glenn R. and Simpson, C. L. (*both, General Electric Co., Richland, Wash.*), **Observations of vertical diffusion rates in stable atmospheres.** *Journal of Meteorology*, 15(1):125–126, Feb. **1958.** fig., 2 tables, 3 refs., 6 eqs. **DWB, DLC**—Results of observations of vertical diffusion rates for stack gases at Hanford, Wash., in summer of 1957, with a source 185 ft above the ground (flat sagebrush covered terrain). Fluorescent pigment tracer material was used and cylindrical impaction samplers held by tethered blimps kept in the visible smoke plume at 500, 1000, 2500 and 5000 ft from the source during stable conditions. The vertical distribution of concentration was symmetrical about the axis of the plume at height of emission (little vertical meandering). Variance of vertical distribution of concentration at various distances and times is shown graphically, given in tables and formulated. *Subject Headings:* **1. Air trajectory tracing 2. Vertical diffusion rates 3. Fluorescent particle tracer technique.** —*M.R.*

10.9–127 551.501.724(26):551.524.4(26):551.526.6

Houghton, D. M., **Some interesting meteorological measurements at sea.** *Marine Observer*, 22(155):43–44, Jan. **1952.** **DWB**—Describes two profiles of air temperature gradient in lowest 12 ft in North Atlantic, and discusses diurnal variation of air and sea temperature, with an estimate of errors (0.5°F) due to presence of ship. *Subject Headings:* **1. Marine meteorological observation 2. Temperature gradient 3. North Atlantic.**—*C.E.P.B.*

10.9–128 551.501.1:551.508.77:551.577

Paulczinsky, W. and Tollner, H., **Zur Methode der Messung von Niederschlägen in mittleren Höhenlagen des Gebirges.** [Method of measuring precipitation at medium elevations of mountains.] *Wetter und Leben*, Vienna, 9(1/2):4–10, **1957.** 3 figs., 2 tables, 4 refs. **DLC**—Comparative studies of precipitation were made at Hochserfaus, at an elevation of 1830 m, with a normal rain gage with calcium chloride and three totalizers of different construction. At an elevation of 1830 m not only wind but also technical factors in the construction of the rain gage influences precipitation measurements. Data are presented on precipitation amounts; the types of defects influencing measurement and the influence of the wind are discussed. *Subject Headings:* **1. Precipitation measurement techniques 2. Rain gage construction 3. Hochserfaus, Austria.**—*I.L.D.*

10.9–129 551.501.4:551.524.7:519.241.1

Belen'kiĭ, M. B., **K voprosu o metodike klimatologicheskoĭ obrabotki nabliudeniĭ nad temperaturoĭ v svobodnoĭ atmosfere.** [The problem of the method of analyzing climatologically observations on the temperature of the free atmosphere.] *Kiev, Ukraine. Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, 4:52–53, **1955.** fig., 2 refs., 3 eqs.—In order to obtain climatologically reliable series of temperatures at different levels the use of the

regression equation, which relates mean temperature at each observed level to mean secular ground temperature, is recommended. This work of reducing the temperature to the normal can be simplified by the fact that the regression coefficient A_k can be expressed by the correlation coefficient, namely:

$$A_k = r_k \frac{\sigma_k}{\sigma_0}$$

where σ_k and σ_0 = square deviations from the mean temperatures corresponding to level k and the earth's surface. The correlation coefficient between the temperature at the earth's surface and the temperature of the free atmosphere above 1 km is given by the equation (obtained empirically from radiosonde data from Odessa):

$$r_k = r_1 - 0.514(r_1 - r_7) \ln H_k$$

where r_k, r_1, r_7 are correlation coefficients between temperatures at the earth's surfaces and temperatures at k levels of 1 and 7 km and H_k = height of level k (in km). A graph showing the variations of correlation coefficients with height during Jan. and July is given. *Subject Headings:* **1. Upper air temperature reduction 2. Regression equations 3. Temperature calculations.**—*I.L.D.*

10.9–130 551.501.4:551.525

Bider, M. and Schüepp, M., **Die Reduktion der 200 jährigen Bodentemperaturreihe.** [The reduction of the 200 year soil temperature series.] *Schweizerische Naturforschende Gesellschaft, Verhandlungen*, 136:87–88, **1956.** table, 4 refs. **DWB, DLC**—The Basel temperature series from 1755–1956 is one of the longest and most homogeneous temperature series in existence. For the reduction of this series, observations from Neuchâtel (1753–1782), Soulce (1785–1802), etc. were used. For the observations of d'Annone the special Basel time (passage of the sun through the meridian 1 o'clock instead of 12 M had to be used) and also radiation errors had to be corrected. Preliminary results of this reduction showing mean and extreme annual and seasonal temperatures are presented. A more complete report is to appear in a forthcoming issue of the same journal. *Subject Headings:* **1. Soil temperature series 2. Temperature reduction 3. Basel, Switzerland.**—*I.L.D.*

10.9–131 551.501.4:519.2:51

Wadsworth, George P.; Bryan, Joseph G. and Crout, Prescott D., **Some statistical and mathematical approaches to meteorology.** Massachusetts Institute of Technology, Div. of Sponsored Research, Contract AF 19(604)-991, Final Report, April 30, **1957.** 104 p. figs., numerous tables, numerous eqs.—The body of this report is divided into three parts. In the first part, some terms in the atmospheric dynamic equations are used as predictors to supplement previous attempts at forecasting, using the basic weather variables and a time-series approach. Also, a statistical, kinematical model is introduced to see how this concept changes the percent of the variability associated with the usual prediction mechanism. The second part of the report deals with probability distributions resulting from the fact that correlation exists from trial to trial. This is applied to climatology and the agreement between theory and observation compared. Thirdly, a mathematical investigation is presented of a possible further explanation of the mechanism of Front and Cyclone formation and also the application of the extension of Thompson's Theorem to certain velocity fields containing vortices. *Subject Headings:* **1. Mathematics in meteorology 2. Statistics in climatology.**—*Authors' abstract.*

10.9–132 551.501.42:551.57

Greinacher, Heinrich (*Physikalisches Inst. der Universität Bern*), **Zur Frage des Ersatzes psychrometrischer Tafeln durch Rechenschieber.** [Substitution of slide rules for psychrometric tables.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 10(4):350–354, **1958.** 5 refs., 7 eqs. German, English and French summaries p. 350. **DWB, DLC**—According to Sprung's formula for obtaining the relative humidity from psychrometer-reading, graphs have been produced. For simplifying the method of reading it has been tried to replace the two-dimensional arrangement by a simple slide rule; in this case the psychrometric formula should correspond to the equation $R = 100\, f(t')/f(t)$ (t = dry temperature, t' = wet bulb temperature), which is not fulfilled by Sprung's formula. Another formula is therefore he

developed, leading to a satisfactory approximation, provided that the division of the R-scale be somewhat modified and differences be allowed up to 2½%. *Subject Headings:* **1. Psychrometric slide rules 2. Relative humidity measurement.**—*Author's summary.*

10.9–133 551.501.45

Levert, C., **A correction to (his) article: Some theoretical considerations with regard to the homogeneity-criteria of Helmert and Abbe.** *Archiv für Meteorologie, Geophysik und Bioklimatologe, Ser. B*, Vienna, 8(3/4):431–432, **1958. DLC**—The correction involves the correction of $\boldsymbol{B}=2\boldsymbol{A}-\boldsymbol{F}$ to $\boldsymbol{B}=2\boldsymbol{A}-2\boldsymbol{F}$ (*Arch. für Met., Geophys. u. Biok., Ser. B*, 8(260):263, **1957**). It is shown that the value of $\rho(AB)$ follows from $2F=2A-B$ and $\sigma^2(2F)=\sigma^2(2A)+\sigma^2(B)-2\rho(A,B)\sigma(2A)\sigma(B)$, substituting $\sigma^2(A)=2n\sigma^4$, $\sigma^2(B)=12n\sigma^4$ and $\sigma^2(F)=n\sigma^4$ accordingly $\rho=2/\sqrt{6}=0.82$. The consequence of this correction is that $P\left[1-\frac{1}{\sqrt{n}}\leq 2\frac{A}{B}\leq 1+\frac{1}{\sqrt{n}}\right]=0.68$ if it is allowed to assume that the quantity $2A/B$ satisfies a normal distribution with mean 1 and standard deviation $1/\sqrt{n}$. (For original article, *see* 9.9–104, Sept. 1958, *MAB.*) *Subject Heading:* **1. Homogeneity.**

10.9–134 551.501.7:551.513.2:551.557.5

Bayer, Karel, **Metoda k určení charakteru cirkulace v hladině 500 mb na severní polokouli.** [A method for determining the character of circulation at the 500 mb level over the Northern Hemisphere.] *Meteorologické Zprávy*, Prague, 11(2):39–44, **1958.** 3 figs. Russian and English summaries p. 39–40. **DLC**—A hemispheric index p is introduced, which renders possible an objective and quick determination of the character of the circumpolar current (jet stream) at the 500 mb level for single days. The index is given as $p=P_2-P_1$, where P_1 is defined as the first closed circumpolar contour drawn outside 85°N and forming the line of demarcation of the region containing all the individual baric centers in the Northern Hemisphere the contours of which have the same or lower values than the demarcating contour. The value of P_2 is defined as the last closed circumpolat contour in the Northern Hemisphere not intersecting the equator and shutting off from the polar region all the closed centers with contours of the same or higher values than its own. Examples of how to determine the values of P_1 and P_2 are given. The paper includes a description of an idealized action of the initial zonal current being changed into a meandrous one, upon values of p. The index also shows an annual variation depending on the intensity of the jet stream. *Subject Headings:* **1. Circulation indexes 2. 500 mb jet stream 3. Northern Hemisphere.**—*From author's abstract.*

OBSERVATIONAL DATA

See also: **Operation Hardtack, 1958,** 10.9–18; **Instructions for aerological yearbooks,** 10.9–34; **IGY sferics networks, Japan,** 10.9–41; **IGY satellite program,** 10.9–44; **Microtext libraries, Little America,** 10.9–47; **Arctic data summaries, Greenland,** 10.9–56; **Argentine Antarctic Exped., 1955–56** (Díaz), 10.9–58; **Upper air soundings, Antarctica** (Tauber), 10.9–63.

10.9–135 551.506.1(469.8)

*Madeira. Serviço Meteorológico, **Boletim mensal das observações meteorológicas no Arquipélago da Madeira, Vol. 12, No. 2, Feb. 1956.** [Monthly bulletin of meteorological observations in the Madeira Islands, Vol. 12, No. 2, Feb. 1956.] issued, Funchal, Madeira. 4 p. At head of t-p: Serviço Meteorológico Nacional. **DWB**—Contains daily values of pressure, temp., sun temp., relative humidity, wind, visibility at 14 h, cloudiness, sunshine, precip. and sea water temp. plus decadal and monthly means of each. Temp., humidity and precip. data are also given for month for 25 stations on Madeira Is. and 4 stations on Porto Santo. Very brief summary of weather for month is appended. *Subject Headings:* **1. Monthly meteorological data bulletins 2. Observational data 3. Funchal, Madeira 4. Madeira Islands 5. Porto Santo Island.**—*M.R.*

10.9–136 551.506.1(44)

*Strasbourg. Université. Faculté des Sciences. Institut de Physique du Globe. **Annales** [Annals], n.s., Vol. 13, 14, 15, 1948, 1949, 1950, **Pt. 1, Meteorologie.** pub. Paris, **1956.**

53 p. almost entirely tables. **DWB, DLC**—Contains in condensed form the observations made from 1948–1950 at the 7 meteorological and 36 rainfall stations of Alsace and Lorraine. Extended tables of 3-time daily values for the standard elements are given for Strasbourg, and monthly averages of 3-times daily, mean and extreme values for the 7 meteorological stations, and total, maximum in 24 hours, number of days with varying amounts of rain, snow, hail, thunder, etc. for the precipitation stations. Special summary tables are given for hourly sunshine, pressure, temperature, humidity, winds, soil temperature, water temperature, hourly amount frequency and duration of precipitation, etc. for Strasbourg for each of the 3 yrs. *Subject Headings:* **1. Annual meteorological data summaries 2. Alsace-Lorraine 3. Strasbourg 4. France.**—*M.R.*

10.9–137 551.506.1(496.1)

*Turkey. Devlet Meteoroloji Isleri Umum Müdürlügü, **Meteoroloji bülteni: ortalama ve ekstrem kiymetler.** [Meteorological bulletin: mean and extreme values.] Ankara, **1953.** 222 p. Almost entirely tables. **DWB**—The average or extreme monthly pressure, temperature, humidity, cloudiness, evaporation, precip., snow, fog, wind, soil temp. (0–50 cm. depth), sunshine duration, black and white bulb actinometer temp., etc., are presented for a number of stations in Turkey for the entire period of record up to 1950 (usually 20–22 years or less). In all, 83 different elements are included. *Subject Headings:* **1. Climatic data for Turkey 2. Turkey. I. Adali, Fuad.**—*M.R.*

10.9–138 551.506.3(4)

Baur, Franz (*Bad Homburg*), **Die langjährigen meteorologischen Beobachtungsreihen Mitteleuropas.** [Long-period meteorological observation series in Central Europe.] *Meteorologische Rundschau*, Berlin, 11(3):100–101, May/June **1958.** table. **DWB, DLC**—In Vol. 2 of the new edition of the **Meteorologisches Taschenbuch** (Leipzig 1953) two series of long period observations on the air temperature of Central Europe (means of DeBilt, Berlin and Vienna) and precipitation amounts for 14 stations (Emden, Kiel, Kleve, Gütersloh, Hannover, Berlin, Kassel, Erfurt, Dresden, Trier, Frankfurt a.M., Bayreuth, Karlsruhe and Munich) which actually include Northern Germany. In order to retain homogeneity, the means should be calculated by the procedure thereto used in each individual station. The supplement to Vol. 3 of the **Meteorologisches Taschenbuch** continues the series to Dec. 1956. Continuation of the series (Tables 165 and 166) for 1957 are presented. *Subject Headings:* **1. Long period records 2. Homogeneity 3. Central Europe.**—*I.L.D.*

10.9–139 551.506.7:551.557(591) 551.576.4:551.591(591)

*Burma. Meteorological Dept., **Pilot balloon data and frequency tables (wind, visibility and height of base of low clouds).** First issue seen, **1948** (annual, in one piece). Latest issue seen, May **1951.** Jan. 1949—monthly. Almost entirely tables. 1948 issue (annual) with title: **Upper air data, 1948, (Pt.) 1, Pilot balloon data. (Pt.) 2, Monthly frequency of winds, visibility and height of base of low cloud at pilot balloon stations. DWB**—Twice daily values for upper air wind direction and speed are tabulated for surface, 0.5, 1, 2, 3, 4, 5, 6, 7, 8 and 9 km levels and the visibility and cloud height and amount given. Frequencies of wind, low cloud height and visibility at the 09 and 15 h observations are tabulated for each month for 8 stations (Akyab, Bassein, Mandalay, Rangoon, Mergui, Sandoway, Tavoy and Victoria Point) in Burma. *Subject Headings:* **1. Upper air wind data 2. Ceiling and visibility data 3. Burma.**—*M.R.*

10.9–140 551.509.616:551.506.7:551.576.11

†McDonald, James E. (*Inst. of Atmospheric Physics, Univ. of Arizona, Tucson*), **The physics of cloud modification.** *Advances in Geophysics*, N. Y., Vol. 5:223–303, **1958.** 5 figs., 9 tables, 107 refs. **DWB, DLC**—A long and systematic review of recent literature on: clouds and water vapor cycle in atmosphere, present status of cloud physics (condensation and precipitation processes), cloud modification techniques and the evaluation of cloud modification experiments. Coalescence processes are stressed. Dry ice, silver iodide, water spray and giant salt nuclei are considered the main current techniques to be studied, but future advances more spectacular than tentative past successes may come from pure research along

lines not yet explored. *Subject Headings:* **1. Cloud modification 2. Cloud physics research 3. Advances in cloud seeding.**—*M.R.*

10.9–141 551.510.53:551.506.7:551.521.17

*†Watanabe, Kenichi (*Hawaii Inst. of Geophysics*), **Ultraviolet absorption processes in the upper atmosphere.** *Advances in Geophysics*, N. Y., Vol. 5:153–221, **1958.** 25 figs., 13 tables, 264 refs., eqs. **DWB, DLC**—An impressively systematic and informative review of current knowledge of ultraviolet absorption and resulting photochemical processes in the upper atmosphere (confined to wave lengths from 2900 Å to 1 Å). The review covers advances made from 1946 to 1957, or from the first rocket soundings to the first artificial satellite. Absorption processes, density, temperature and composition of upper atmosphere, solar ultraviolet and X-rays, absorption cross sections of O_2, N_2, NO, O_3, H_2O, N_2O, CO_2, O, N, CH_4, NH_3, CO, H_2 and No and, finally, penetration of solar ultraviolet, the ozone layer, O_2 dissociate layer, D, E and F layers. Many absorption cross sections and energy level diagrams are given, along with much tabular data and hundreds of references. *Subject Headings:* **1. Ultraviolet absorption in upper atmosphere 2. Absorption cross sections 3. Photochemical processes in ultraviolet absorption 4. Advances in ultraviolet absorption studies.**—*M.R.*

INSTRUMENT CARRIERS

See also: **Project Vanguard** (Caidin), 10.9–27; **IGY satellite program,** 10.9–44; **Satellite Photog.,** 10.9–45; **Severnyĭ Polius Exped., 1954–55** (Iatsun), 10.9–54; **Ionospheric satellite obs.** (Munro, White), 10.9–104; **Satellite orbits** (Miczaika, Wahl), 10.9–105; **Satellite obs.** (Pérard), 10.9–107; **Satellite obs., Curaçao** (Telle), 10.9–108; **Rocket radiation data** (Behring et al.), 10.9–204; **Satellite cosmic ray meas.** (Aono, Kawakami), 10.9–216; **Aerial snow cover obs., Ugra River Basin, U.S.S.R.** (Rakhmanov, Sapozhnikov), 10.9–274.

10.9–142 551.507.362.1:551.557:551.501.7

Winds in the upper atmosphere. *Science*, Wash., D. C., 127(3305):1037, May 2, **1958. DLC**—A new method of plotting winds in the upper atmosphere has been developed by the U. S. Army Signal Engineering Laboratories, Fort Monmouth, N. J. From a maximum height of 54 mi in the atmosphere down to levels of less than 100,000 feet, measurements of winds have been recorded by using rockets which release confetti-like aluminum chaff. Test results at White Sands, New Mex., and Patrick Air Force Base, Fla., have shown that the wind speeds at these heights are generally the same and its direction westerly. *Subject Headings:* **1. Upper air wind measurement techniques 2. Rocket release aluminum foil 3. Window (metal foil) 4. Wind velocities 5. Florida 6. New Mexico.**—*N.N.*

10.9–143 551.507.362.1:551.510.53

Tousey, R. (*U. S. Nav. Res. Lab., Wash., D. C.*), **Rocketry.** *Smithsonian Contributions to Astrophysics*, Wash., D. C., 1(1):39–44, **1956.** 14 refs. **DLC**—The development of V-2 rocket in Germany after World War II made possible research on the observations of the ultraviolet and X-ray spectra of the sun and the stars. Improvements that are needed in astronomical rocketry are outlined here for solar spectrum and upper atmosphere physics. Satellite developments will be of great use in the astronomical study of micrometeorites from the sun. *Subject Headings:* **1. Rocket development 2. Upper atmosphere research.**—*N.N.*

10.9–144 551.507.321.2:551.508.82

Gilpatrick, A. E. and Früge, R. C., Jr., **Equipment and techniques for inflight deployment of long train instrumentation packages from high altitude balloons.** *U. S. Air Force Cambridge Research Center, Instrumentation for Geophysics and Astrophysics*, No. 9, Sept. **1958.** 19 p. 11 figs. (incl. photos), table, 2 refs. **DLC**—This report discusses and describes a technique and the equipment necessary to deploy and accurately position (relative) several instrumented canisters weighing a total of 300 lbs. along a 3000-ft line during ascent of a high-altitude balloon. The system is compact at time of launch. Its configuration and equipment should satisfy a number of anticipated requirements; and, if major changes are required in the system's capacity, they can be made by simple design modifications. This technique is concluded to be

ideally suited for positioning long trains of delicate instruments from ascending high-altitude balloons for such purposes as the simultaneous measurement and telemetering of ambient pressures and temperatures, measurements sufficient for gradient determinations in the earth's atmosphere. *Subject Headings:* **1. High altitude balloons 2. Air-borne instruments.**—*Authors' abstract.*

INSTRUMENTS

See also: **WMO Comm. for Instruments and Methods of Obs., 10.9–50; Precip. meas. techniques, Hochserfaus, Austria** (Paulczinsky, Tollner), **10.9–128; High alt. balloons** (Gilpatrick, Fruge), **10.9–144.**

10.9–145 551.508

Agarwala, K. S. (*Met. Office, New Delhi*), **Recent developments in meteorological instruments and techniques in India.** *Indian Journal of Meteorology and Geophysics*, Delhi, 9(3): 207–212, July **1958.** 2 figs., 23 refs. **DWB, DLC**—In a previous article (AGARWALA, 1949) the author had given a review of the work done on the development and designing of meteorological instruments in India up to that time. In this article an attempt has been made to review briefly the work done in the subsequent eight-year period. Work on the design and construction of meteorological and other necessary instruments has been undertaken mainly at the laboratories and workshops of the India Meteorological Department at New Delhi and Poona and at the Solar Physics Observatory at Kodaikanal. Besides the Meteorological Department, the National Instruments Factory (formerly Mathematical Instruments Office), Calcutta, which has been considerably expanded and modernized in recent years by the Government of India has made significant contribution in this direction. *Subject Headings:* **1. Meteorological instruments 2. India.**—*Author's abstract.*

10.9–146 551.508:551.501.9

Sokič, S., **Meteorološka laboratorija.** [Meteorological laboratory.] *Yugoslavia. Hidrometeorološka Služba, Vesnik*, 6(1/2):43–47, Jan./June **1957. DWB**—The meteorological laboratory at the Hydrometeorological Institute of Yugoslavia was founded in 1950 and became operative in 1952. Since then some 4000 meteorological instruments have been verified. The laboratory is equipped with a modern apparatus for verification of all types of thermometers within a range from −35 to +60°C; a climatic chamber, chambers for verifying aneroid and mercurial barometers and barographs, a mercury distilling apparatus, apparatus for filling mercurial barometers, standard instruments and other instruments for instrument verification, and workshop equipment for minor repairs. *Subject Headings:* **1. Meteorological laboratories 2. Yugoslavia.**—*G.T.*

10.9–147 551.508.2:551.525

Coutts, J. R. H. (*University of Aberdeen, Scotland*), **Observations of soil temperatures in North-East Scotland.** *International Congress of Soil Science, 6th Paris*, 1956, Vol. 1:193–199. 3 figs., 6 refs. German, English and French summaries p. 198/199.—A description is given of a simple portable multipoint temperature recorder in which the sensitive elements are thermistors. The power supply is provided by a 1.5 volt cell. The instrument is intended for use at sites where main supplies of electricity are not available and where transport facilities are restricted. To illustrate the performance of the instrument, diagrams are presented to show soil temperatures on a hot day in July 1955, and temperature profiles near the surface in a period of snow, followed by thaw, in February 1956. *Subject Headings:* **1. Soil temperature instruments 2. Thermistors 3. Northeast Scotland.**—*Author's abstract.*

10.9–148 551.508.21

Albrecht, Fritz (*Schramberg-Sulgen*), **Über Pyrgeometer.** [On pyrgeometers.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vienna, 9(1):42–59, **1958.** 4 figs., 32 refs., 6 eqs. English and French summaries p. 42. **DLC**—This paper tries to give a survey on the main principles of the construction of pyrgeometers. The theory of the apparatus with thin films of plastic materials permeable in infrared is treated particularly. A pyrgeometer using Anders Ångström's principles of the infrared-permeable shell, of gray and

metallic strips, and of half-hemispheric cover is proposed for further investigations of temperature radiation of the atmosphere. *Subject Heading:* **1. Pyrgeometers.**—*Author's abstract.*

10.9–149 551.508.26:551.525.4

Gödecke, K., **Erfahrungsberichte über Schutz der Erdbodenthermometer vor Frostschäden.** [Reports of experience gained in the protection of soil thermometers against frost damage.] *Germany. Deutscher Wetterdienst. Instrumentenamt Hamburg, Hamburg, Technische Mitteilungen des Instrumentenwesens*, New Ser., No. 3:44–45, **1957. DWB**—Rubber and metal holders do not prevent the breakage of soil thermometers in frozen soil. In most cases strains arise between the thermometers and their holders as a result of which breakage occurs. In order to eliminate the strain against the holders, the clamps of the holders were widened so that the thermometer did not experience strain during soil movements. *Subject Headings:* **1. Soil thermometers 2. Frost damage to soil thermometers.**—*I.L.D.*

10.9–150 551.508.27

Gödecke, K., **Beitrag zur Messung der Lufttemperaturen in Hütten mit verschiedenem Farbanstrich.** [Contribution to the measurement of air temperature in shelters painted with different colors.] *Germany. Deutscher Wetterdienst. Instrumentenamt Hamburg, Hamburg, Technische Mitteilungen des Instrumentenwesens*, n.s., No. 3:5–15, **1957.** 4 figs., 2 tables, 8 refs. **DWB**—The results of comparative measurements of air temperature made over a period of 2½ yrs in shelters painted white, aluminum and black are presented and analyzed. Data are given on the numerical and percent frequency distribution of deviations of dry and wet bulb thermometer readings in the black and aluminum shelters from those in the white shelters, the arithmetic mean of the mean deviation of the dry and wet bulb temperature in the black and aluminum shelters from those in the white shelter, the standard deviation, the deviation of the air temperature in the aluminum and black shelters at noon, maximum deviation, etc. 96.3% of all the temperatures measured had deviations of only ±0.3°C among them. The agreement among all these temperatures can be explained by the fact that the absorptivity of white paint in the "infrared is between 80 and 90% so that white paint is almost black in the infrared region of the spectrum. *Subject Heading:* **1. Thermometer screens.**—*I.L.D.*

10.9–151 551.508.27

Hungerford, Kenneth E. (*Idaho Cooperative Wildlife Res. Unit, Univ. of Idaho*), **A portable instrument shelter for ecological studies.** *Ecology*, Durham, N. Carolina, 38(1):150–151, Jan. **1957.** fig., ref. **DWB**—A small light instrument, shelter just big enough for a hydrothermograph or a maximum–minimum thermometer, is described and illustrated. It is useful for ecological studies and is easily mounted on a single post. It has been used in the study of ecology of the ruffed grouse in Northern Idaho. Side panels are aluminum louvers with bent slits. Temperatures in first model varied <1°F from those in standard Weather Bureau shelter at temperatures <70°F and 1.5–2°F from 80° to 90°F. This error was corrected by using a double roof so that results are comparable from 0° to 97°F. Materials used in construction are specified in detail. *Subject Headings:* **1. Thermometer screens 2. Portable instrument shelters.**—*M.R.*

SYNOPTIC ANALYSIS AND FORECASTING

SYNOPTIC ANALYSIS

See also: **Numerical forecasting symposia,** 10.9–3; **Synoptic met. texts.** (Genemon), 10.9–15; **Constant pressure analysis manuals,** 10.9–36; **WMO Comm. for Synoptic Met.,** 10.9–51; **Forecast. services, Yugoslavia** (Simić), 10.9–66; **Entropy** (Bagrov), 10.9–188; **Runóff forecast., Ob River, U.S.S.R.** (Istoshina), 10.9–275; **Flood forecast. and harmonic anal., Paraná River** (Machado, Marchetti), 10.9–279.

10.9–152 551.509.313:551.515.8

Sadokov, V. P., **K uchetu vliianiia frontal'nykh razdelov pri kratkosrochnom prognoze davleniia i vertikal'nykh skorosteĭ.** [Calculating the influence of frontal discontinuities in

short-range forecasting of pressure and vertical velocities.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, No. 60:17–21, **1957.** 4+1 figs., 3 refs., 19 eqs. **DWB** (M(055) U581tts). Review in Hungarian by P. Ambrózy in *Időjárás*, 62(5):297–300, Sept./Oct. **1958.** 2 figs., 4 refs., eqs. **DLC**—The dynamic equations, that is, the equations for vorticity and the adiabatic equations, used in short range forecasting of large scale atmospheric processes are written approximately in the form:

$$\Delta\frac{\partial H}{\partial t}-\frac{l^2\partial\tau}{g\partial\rho}=\frac{g}{e}(H,\Delta H)-\frac{\partial e\partial H}{\partial y\partial x}$$

$$P\frac{\partial p}{\partial p}\left(\frac{\partial H}{\partial t}\right)+\frac{m^2C^2}{g}\cdot\frac{\tau}{\rho}=\frac{g}{e}\rho\left(\frac{\partial H\cdot H}{\partial p}\right)$$

The problem of frontal discontinuities in short range forecasting is solved by regarding the atmosphere as a double layer fluid, of which each layer corresponds to a warm or cold air mass. In each layer m is regarded constant but different. With the assumption of $\frac{\partial\rho_1}{\partial t}=\frac{\partial\rho_2}{\partial t}$ and $U_{n1}=U_{n2}$ the above equations were solved by Fourier's method, and the solution presented in the form of spatial integrals is:

$$\frac{\partial H_1}{\partial t}=\frac{1}{4\pi}\int\int\int G_1^{(1)}(P\bar{H}\rho' r)F(x',y',\rho')a\sigma$$

$$+\frac{1}{2\pi}\int\int G_2^{(1)}(P,\pi,r)\left[(u_1-u_2)\frac{\partial\xi}{\partial x}+(v_1-v_2)\frac{\partial\xi}{\partial y}\right]ds,$$

$$\frac{\partial H_2}{\partial t}=\frac{1}{4\pi}\int\int\int G_1^{(2)}(P_1\pi^t p' r)F(x',y,\rho')d\sigma$$

$$+\frac{1}{2\pi}\int\int G_2^{(2)}(P,\pi,r)\left[(u_1-u_2)\frac{\partial\xi}{\partial x}+(v_1-v_2)\frac{\partial\xi}{\partial y}\right]ds$$

F=known function depending upon thermobaric atmospheric fields. $P=\pi$—height of front $z=(x,y,t)r$ equation of frontal surface in the system of coordinates x, y, z, t

$$\gamma=\sqrt{(x'-x')^2+(y-y')^2}G_1^{(1)}\cdot G_1^{(1)},\ G_2^{(1)}\cdot G_2^{(2)}$$

—Green's function of the problem involved. The second integrals of the latter equation describe the principle effect produced by a frontal discontinuity. The determination of the vertical velocity in a frontal zone associated with the discontinuities in the wind field is obtained by integrating the equation of vorticity along the vertical and making $\tilde{\tau}=0$ at both the upper and lower levels of the atmosphere. The derivation of the relevant equation is presented and the calculation of vertical movement in a frontal zone is outlined. *Subject Headings:* **1. Numerical forecasting 2. Frontal effects in numerical forecasting 3. Short range forecasting.**—*I.L.D.*

10.9–153 551.509.313:551.509.324:551.511

Smagorinsky, Joseph (*Acting Chief, Cir. Res. Sec., U.S.W.B.*), **On the inclusion of moist adiabatic processes in numerical prediction models.** *Germany. Deutscher Wetterdienst, Berichte*, 5(38):82–90, **1957.** 7 figs., 5 refs., 41 eqs. English and German summaries p. 82. **DWB, DLC**—The use of the dry-adiabatic, quasi-linearized 3-level barotropic model to predict large scale averaged precipitation does not lead to successful results even when convective precipitation is taken into account. The discrepancy is attributed mainly to the result of incorrect vertical motions inherent in baroclinic models. Also in addition to convective activity the neglect of the feed-back and heat of condensation and the linearization of the static stability could account for a considerable part of the discrepancy between predicted and large scale observed precipitation. It is postulated that the heat of condensation has an important destabilizing influence which manifests immediately in vertical motions. Accordingly, equations are derived for a 3-level moist adiabatic model and the means of solution and the results of controlled experiments from which the above hypothesis was deduced are pre-

sented. *Subject Headings:* **1. Numerical forecasting 2. Adiabatic processes.**—*I.L.D. and author's summary.*

10.9–154 551.509.313

Terauchi, E., **Some researches on the graphical methods of forecasting, Pt. 1.** *Journal of Meteorological Research,* Tokyo, 9(6):394–399, July **1957.** 4 figs., 8 refs., 33 eqs. **DWB**—The author made the close examination of the basis of the so-called "Graphical Methods," especially of Estoque's Method and Fjørtoft's Method. First he discussed the relation between $\omega(dp/dt)$ and $A(p)$, from the viewpoint of 2-parameter model. Then he decided the form of $A(p)$ when ω-distribution is parabolic or sinusoidal, and concluded that the so-called "Fjørtoft Method" cannot be used when lows or highs are developing or decaying. *Subject Headings:* **1. Graphical forecasting models 2. Fjørtoft's graphical method.**—*Author's abstract.*

10.9–155 551.509.313

Thompson, Philip D., **Numerical predictions: an exposition and review for the non-specialist.** *American Meteorological Society, Bulletin,* 38(8):447–452, Oct. **1957.** 2 figs., 3 refs. **DWB**—Without going into the mathematical derivations, the author describes the basic concepts and practical operations involved in numerical weather prediction. Analogy between astronomical and meteorological predictions by numerical methods is better than might be expected—the difference lies only in the degree of accuracy attainable. The operations used at present by the JNWP unit at Suitland, Md. in respect to processing of data input and instructions to the machine thereafter, are described simply and effectively. (For abstract of this title from another source, *see* 8F–164, June 1957, *MAB.*) *Subject Headings:* **1. Numerical forecasting 2. U. S. Joint Numerical Weather Prediction Unit.**—*M.R.*

10.9–156 551.509.313:551.577

Tokyo. Univ. Earth Physics School, **Suuchi hohoo hoshiki ni yoru rai-u yohoo.** [Rainfall forecast by the numerical forecast method.] Tokyo, Daigaku Chikyu Butsurichaku Kyoshitsu, Nov. **1954.** 11 p. 7 figs. In Japanese: legends of figs. in English superimposed. **DWB** (M09.312 T646su)—Based on a synoptic aerological analysis of data for the U. S. for March 21–22, 1949. Possible precipitation is computed by summing up observed water vapor from surface to 300 mb. The calculated is compared with observed rainfall on charts. Greatest concentration is in Mississippi Valley. *Subject Headings:* **1. Numerical rainfall forecasting 2. United States.**—*M.R.*

10.9–157 551.509.313

*Wolff, Paul M. (*Cdr. U. S. N., Joint Numerical Weather Prediction Unit, Suitland*), **The error in numerical forecasts due to retrogression of ultra-long waves.** *Monthly Weather Review,* Wash., D. C., 86(7):245–250, July **1958.** 10 figs., 3 tables, 5 refs., 5 eqs. **DWB, DLC.** Also: Clapp, Philip F. (*Extended Forecast Sec., U. S. W. B., Wash., D. C.*), **Comments.** *Ibid.,* 86(8):298; 327–328, Aug. **1958.** 8 refs., 8 eqs. **DWB, DLC.** Preliminary version of original issued as *U. S. Joint Numerical Weather Prediction Unit, Technical Memorandum,* No. 13, April **1958.** 9 p. charts, 3 tables. **DWB** (M09.312 U583t)—Error charts for the numerical barotropic forecasts prepared at the Joint Numerical Weather Prediction Unit since Oct. 1957 have revealed retrogressive patterns of very long wavelength. These errors are shown to be due to changes in the large-scale components predicted by the numerical model. These components are actually quasi-stationary in the atmosphere. Forecasts prepared with an approximation to these components held unchanged show significantly increased accuracy. Finally, some of the difficulties in developing a more acceptable physical approach to this problem are outlined. *Subject Heading:* **1. Numerical forecast errors.**—*Author's abstract.*

10.9–158 551.509.313

Zikmunda, Otakar, **Prognoz vysoty absoliutnoĭ topografii 1000 mb, vyvedennyĭ s pomoshch'iu graficheskogo metoda.** [Forecasting the height of the 1000 mb surface by a graphical method.] *Studia Geophysica et Geodaetica,* Prague, 1(1):157–172, **1957.** 4 figs., 2 tables, refs., 25 eqs. English summary p. 172. **DWB**—From SUTCLIFFE's relative divergence and

vorticity equation, a formula is derived for local changes of vorticity at the 1000 mb surface. By means of a geostrophic approximation the formula can be used for forecasting the height of that surface. The formula can be integrated graphically. Results of the graphical integration have been verified statistically. It is found that the accuracy of the proposed method is similar to that of Fjørtoft. *Subject Headings:* **1. Numerical forecasting 2. Geostrophic approximation 3. Graphical forecasting models.**—*Author's abstract.*

10.9–159 551.509.314:551.511:536.7

Kohlsche, Kurt, **Bemerkungen zur Verwendung des Begriffes der Informationsentropie für Vorhersageprobleme und Ableitung einer Beziehung zur Bewertung von Prediktoren** [Remarks on the application of the concept of information entropy to forecasting problems and introduction to an expression for the evaluation of predictors.] *Zeitschrift für Meteorologie* 11(7):193–199, **1957.** ref., 23 eqs. **DWB, DLC**—The importance of the concept of information theory for forecasting problems is examined by deriving SHANNON'S H function, namely

$$H(p_i) = -\sum_{i=1}^{n} p_i \ln p_i$$

in a manner different from that employed by SHANNON. Without using the H function, the author develops a forecasting procedure which gives a maximum accuracy for given predictors. The percent accuracy for a purely climatological forecast is determined. Since the forecast depends upon the class of the characteristics to be predicted (precision of the forecast) a classification procedure considerably independent of the class can be developed. *Subject Headings:* **1. Statistical forecasting 2. Entropy.**—*Author's abstract and I.L.D.*

WEATHER CONTROL

See also: **Cloud physics and seeding** (WMO), 10.9–23; **Cloud modification** (McDonald), 10.9–140.

10.9–160 551.509.

Bello, Francis, **Forecast for weather control: brighter.** *Fortune*, N. Y., 57(5):144–14 166–168, etc., May **1958.** figs. **DLC**—A well-written and colorfully illustrated article o what has been done along lines of weather control in the U. S., and prospects for future develop ments in this field. Schematic illustrations show how ground based AgI generators operate t transform supercooled clouds into precipitation producing clouds, and how warm cumulus cloud may be seeded from above by an airplane to produce showers, and colored charts of the U. S show where rainmaking would be more or less effective or where hail storms, tornadoes an hurricanes might be suppressed, and where inconclusive experiments have been performed various parts of the country. Possibilities such as melting of ice by decreasing the albedo increase in research, use of satellites and electronic computers are discussed. *Subject Heading* **1. Weather control 2. Cloud seeding.**—*M.R.*

10.9–161 551.509.6

†Junge, Christian E., **Methods of artificial fog dispersal and their evaluation.** *U. S. A Force. Cambridge Research Center, Air Force Surveys in Geophysics*, No. 105, Sept. **1958.** 19 2 tables, 25 refs. **DWB, DLC**—In this Survey an attempt was made to include all fog dispers methods and suggestions whether tested or not. Some may have been overlooked; but the li is considered fairly complete, falling in classes of dispersal by heating, desiccation, mechanic means, and electrical means. Only the principal ideas and basic facts are given, and in the cases of impracticability, the reasons for being impractical are included. Experimental resu and field tests are carefully listed; and essential facts and considerations are summarize including conclusive remarks about the methods' applicational possibilities. For the ti being, the improved and mobile heating methods appear superior and all efforts should be ma to improve them. Although chemical and electrical methods appear to be fairly impracti and not very promising, more systematic research is needed to draw final conclusions. *Subj Heading:* **1. Artificial fog dissipation.**—*Author's abstract.*

10.9–162 551.509.616:551.576.11:551.594.12

Imianitov, I. M.; Kulik, M. M. and Chuvaev, A. P., **Predvaritel'nye dannye ob opytakh po regulirovaniiu razvitiia i izmeneniia elektricheskogo sostoiania oblakov moshchnoĭ konvektsii v iuzhnykh raĭonakh Evropeĭskoĭ territorii Soiuza SSR i v Zakavkaz'e.** [Preliminary data on experiments in regulating the development and changes of electric conditions in strong convection clouds in the southern regions of European U.S.S.R. and the Transcaucasus.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 67(129):33–58, **1957.** 20 figs., 5 refs. **DWB**—In the summer, a series of experimental flights along the air routes of Rostov-Krasnodar, Rostov-Mineral'nye Vody, Kiev-Zolotonosha and Sukhumi-Tiflis were made in order to investigate the effect of solid CO_2 particles upon powerful convection clouds, cloud fields or individual clouds that had not attained the freezing layer and did not produce a radar echo. The temperature of the surroundings when the reagent was introduced was −4°C. A detailed description of the individual flights, including synoptic maps of the particular weather situation, graphs showing electron charge within the clouds during the flight, radar screen images and cloud photographs. In clouds of intensive convective activity whose tops have not yet reached the freezing state the electric field is relatively small. The introduction of solid CO_2 into the supercooled tops of convective clouds produces rainfall and dissipates the clouds. The electric field increases by 6–7 times in 5 min. This increase is associated with the appearance of ice particles and large particles producing radar reflections. The radar echoes appeared first only after the cloud summits had reached the crystallization level and they always appeared after the seeding with the solid CO_2. In purely aqueous clouds which are well developed vertically the electric field on the average does not exceed 20 volts/cm; in clouds of mixed structure it may exceed 100 volts/cm. A table giving data on the changes in electric field produced by the seeding of intense convection clouds is included and the possibility of thunderstorm and hail prevention is discussed. *Subject Headings:* **1. Electrification of clouds 2. Convective cloud electrification 3. Cloud seeding with dry ice 4. Cloud seeding in U.S.S.R. 5. European U.S.S.R.**—*I.L.D.*

10.9–163 551.509.616

Weickmann, H., **Current understanding of the physical processes associated with cloud nucleation.** *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 30(1):97–118, **1957.** 5 tables, 19 figs. (incl. photos). German, French and English summaries p. 97. Special abstract in English, p. 118. **DWB, DLC**—Cloud dissipation experiments, AgI seeding to produce rainfall and hail prevention possibilities are discussed and illustrated graphically and quantitatively in text and tables. The author discovered that 1g of dry ice would generate near 10^9 ice crystals at −10°C (not 10^{16} as Langmuir claimed for −20°C). A graph shows number of ice crystals formed by AgI, CdI_2 and CoI_2 at temperatures of 0° to −20°C and natural nuclei at −10° to −33°C. Formation of artificial warm front and artificial shower precipitation are also discussed at length. Modest increases may be attained in warm front clouds by increasing markedly the number of nuclei. This will tend to increase the showery activity in these clouds and the increase in precipitation will be proportional to the natural rate of precipitation. Increase in number of freezing nuclei in shower clouds might also increase the amount of hail particles and thus the precipitation. It is believed that any attempt at hail prevention by seeding would increase the probability of hail, but more research is needed. *Subject Headings:* **1. Cloud seeding with silver iodide 2. Cloud dissolution 3. Hail suppression.**—*M.R.*

10.9–164 551.509.617

Adderley, E. E. and Twomey, S. (*both, Div. of Radiophysics, C.S.I.R.O., Sydney, Australia*), **An experiment on artificial stimulation of precipitation in the Snowy Mountains region of Australia.** (In: U. S. Advisory Committee on Weather Control, Final Report, **1957.** 2:291–295. 5 figs., ref.) **DWB, DLC.** Also in: *Tellus*, Stockholm, 10(2):275–280, May **1958.** 5 figs., table, ref. **DLC**—A report on a long term experiment on artificial rain production by AgI cloud seeding being carried out in Australia jointly by the Snowy Mountains Hydroelectric Authority and the Commonwealth Scientific and Industrial Research Organization in June 1955. The method of control for comparing seeded and unseeded areas involved the use of random periods for seeding. In the light of circulation conditions over southeast

Australia where the pressure system from west to east has an average period of 6 to 7 days, the period of seeding had to be not less than 8 days. The estimation of precipitation, the area of operation, (shown on maps) and the AgI smoke generator (illustrated by a diagram) are described and the operational procedure is outlined. The results, presented in a table and graph, the ratios of cumulative sums of the precipitation in the target and control areas, indicate that the ratios of target area to control area precipitation are greater during the seeded periods but the number of observations is far too inadequate to determine whether there is an effect due to the seeding program. *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding with silver iodide 3. Snowy Mts., Australia.**—*I.L.D.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

ATMOSPHERIC POLLUTION

See also: **Aerosol texts.** (Avy), 10.9–8; **Atmos. pollution meas.** (Gelman), 10.9–125; **Atmos. pollution effects on cooling** (Yamamoto), 10.9–206.

10.9–165 551.510.42:551.575.

Faith, W. L. (*Air Pollution Foundation, Los Angeles, Calif.*), **The role of motor vehicle exhaust in smog formation.** *Air Pollution Control Association, Journal,* 7(3):219–221, Nov **1957.** table. **DLC, DWB**—Smog has come to mean "any abnormal concentration of matter in the atmosphere which is sufficient to harm or annoy people." Motor vehicle exhaust has been one of the smog contributive agents because of its smog forming capacity. Eye irritation and atmospheric oxidant have been reported to plague Los Angeles directly because of the widespread sources of organic vapor from the auto exhaust. Meteorological factors conducive to such smog-formation in different areas, and the differences between the West Coast smog and that commonly experienced elsewhere are discussed. Three approaches for solving the auto exhaust problem are included. *Subject Headings:* **1. Smog 2. Exhaust gases 3. Atmospheric pollution 4. Los Angeles, Calif.**—*N.N.*

10.9–166 551.510.42:629.11

Greifer, Bernard and Friedman, Raymond (*both, Atlantic Research Corp., Alexandria, Va.*) **Combustibility of simulated automobile exhaust gases.** *Air Pollution Foundation, San Marino, Calif., Report* No. 25, Sept. **1958.** 36 p. 5 figs. (incl. photo), 5 tables, 20 refs., 3 eqs.— The combustibility of automobile exhaust gases has been studied to provide a sound basis for judging the feasibility of reducing atmospheric pollutants by means of noncatalytic afterburners for automobiles. Synthetic automobile exhaust gases were prepared and burned in the laboratory on a flat-flame burner capable of burning extremely weak (fuel-poor) mixtures. The mixtures tested embraced a wide range of burnable and nonburnable compositions, based on mass spectrometer analyses of actual automobile exhausts reported in the available literature. Equations and a correlation curve are presented, which enable the flammability of an automobile exhaust to be predicted from a knowledge of its composition and temperature. For any oxygen-deficient mixture it is assumed that the stoichiometrically required quantity of secondary air has been added. On the basis of certain reported gas analyses, it is calculated that exhaust compositions corresponding to deceleration and idling conditions will burn if introduced into an ideal afterburner at 440°F. Exhaust gases corresponding to other engine operating conditions will be flammable only if they are assumed to enter the afterburner at much more elevated temperatures. In the most unfavorable case, which is the cruising condition, it is estimated that the exhaust would have to have a temperature of approximately 1240°F to be flammable. *Subject Headings:* **1. Automobile exhaust pollution 2. Automobile gas combustion experiments 3. Exhaust gases.**—*Authors' abstract.*

10.9–167 551.510.42:551.511

Hewson, E. Wendell, **Air Pollution Research Seminar, Cincinnati, December 18, 195 report of the Meteorology Committee, E. Wendell Hewson, Chairman.** *U. S. Public Heal Service, Public Health Reports,* 72(4):371–372, April **1957. DNLM**—At a meeting of t

Meteorology Committee in Cincinnati, Dec. 18, 1956, the Chairman of the Committee made recommendations for a design of major air pollution investigation, the development of adequate meteorological instrumentation and methods of analysis of new resulting data. Model studies of atmospheric diffusion as well as studies of nucleation, atmospheric transmission and absorption of solar radiation and research work on dispersion were also recommended. *Subject Headings:* **1. Atmospheric pollution 2. Atmospheric diffusion.**—*N.N.*

10.9–168 551.510.42

Holzapfel, L.; Cauer, H.; Hesse, F. and Reiter, R., **Über das Vorkommen molybdataktiver Kieselsäure in natürlichen Aerosolen.** [Origin of active molybdenum silicic acid in natural aerosols.] *Die Naturwissenschaften*, Berlin, 45(7):160, April 1, **1958.** fig., ref. **DLC**—Determination of air pollution is generally made by filtration method and by analysis of rainfall. The apparatus of MALTER and WENDE for the extraction of air humidity permits an examination on every moment. The examination of aerosols condensations in three bioclimatological stations in Germany indicates no presence of active molybdenum silicic acid at Farchant bei Partenkirchen (Alps), at Norderney (North Sea coast) and in Berlin-Dahlem. Only at Bochum has the presence of small quantities been observed. The origin of this presence is probably caused by thermical reactions. *Subject Headings:* **1. Atmospheric pollution 2. Aerosol condensation 3. Molybdenum 4. Germany.**—*A.V.*

10.9–169 551.510.42

Kethley, T. W.; Orr, Clyde, Jr.; Fincher, E. L. and Dallavalle, J. M. (*all, Engin. Exp. Sta., Georgia Inst. of Tech.*), **Airborne microorganisms as analytical tools in aerosol studies.** *Air Pollution Control Association, Pittsburgh, Journal*, 7(1):16–20, May **1957.** 3 tables, 21 refs. **DWB, DLC**—A technique is described whereby microorganisms are dispersed in air for the purpose of studying various phenomena, including dispersion of aerosols, filter efficiency, presence of trace vapors and gases, air flow in ventilating systems and diffusion of stack effluents. *Subject Headings:* **1. Air-borne microorganisms 2. Aerosol dispersion.**—*G.T.*

10.9–170 551.510.42

Nelson, Harlan W. and Lyons, Carl J. (*both, Battelle Memorial Institute, Columbus, Ohio*), **Sources and control of sulfur-bearing pollutants.** *Air Pollution Control Association, Journal*, 7(3):187–193, Nov. **1957.** 5 figs., 3 tables, 12 refs., eqs. **DWB, DLC**—This paper lists 4 possible remedies applicable to the problem of controlling the undesirable effects of discharging waste that contains sulfur dioxide, as it emits into the atmosphere. The remedies include: the direct approach, a more efficient dispersion of effluent gases into the atmosphere, the fixation of the sulfur in solid form by adding chemical materials and the washing or treating of the stack gases to remove the sulfur oxides before the gases are discharged to the atmosphere. These methods are discussed in this paper. Typical examples of the existing refinery plants in the U. S. were quoted in 1956 to be 17 in population centers. Of these plants, the Los Angeles area was recovering 180 tons/day of sulfur, 120 tons in the Houston, Texas area, 165 tons in the Philadelphia area. *Subject Headings:* **1. Atmospheric pollution control studies 2. Sulphur dioxide.**—*N.N.*

STRUCTURE OF THE ATMOSPHERE—UPPER ATMOSPHERE—IONOSPHERE

See also: **Radiowave propagation** (Dolukhanov), 10.9–12; **Airborne ionospheric meas., Arctic** (Gassmann), 10.9–57; **Ionospheric obs. by satellites** (Munro, White), 10.9–104; **Satellite obs.** (Pérard), 10.9–107; **Ultraviolet absorption in upper atmos.** (Watanabe), 10.9–141; **Rocket develop.** (Tousey), 10.9–143; **Ionospheric reflection** (Srivastava), 10.9–318.

10.9–171 551.510.535:621.396.029

Argence, E. (*S.P.I.M. Fribourg*), **Détermination des trajectoires d'énergie d'une onde se propageant dans l'ionosphère. Étude de deux cas particuliers (milieu transparent).** [Determination of trajectories of energy waves propagating in the ionosphere. Study of two particular cases (in transparent media).] *Annales de Géophysique*, 10(3):249–253, July/Sept.

1954. 2 figs., 2 tables, 10 refs., numerous eqs. French summary p. 249. **DLC**—Assuming an ionized transparent anisotropic medium, a direct method for the determination of energy trajectories was developed. Trajectories for normal and oblique incidence are computed for various maximum critical frequencies along the magnetic equator. The mathematical theory is presented in detail. An experimental study for oblique incidence is suggested. *Subject Headings:* **1. Ionospheric radio wave propagation 2. Radio wave propagation theories 3. Magnetic equator.**—*A.A.*

10.9–172 551.510.535:629.13.035

Baldwin, Lionel V. and Blackshear, Perry L. (*both, Lewis Flight Propulsion Lab. Cleveland, Ohio*), **Preliminary survey of propulsion using chemical energy stored in the upper atmosphere.** *U. S. National Advisory Committee for Aeronautics, Technical Note*, 4267, Washington, D. C., May **1958.** 73 p. 12 figs., tables, 24 refs., eqs. **DLC**—Ram-jet cycles that use the chemical energy of dissociated oxygen for propulsion in the ionosphere are presented. After a review of the properties and compositions of the upper atmosphere, the external drag, recombination kinetics, and aerodynamic-heating problems of an orbiting ram jet are analyzed. The study indicates that the recombination ram jet might be useful for sustaining a satellite at an altitude of about 60 miles. Atmospheric composition and recombination-rate coefficients were too uncertain for more definite conclusions. The ram jet is a marginal device even in the optimistic view. *Subject Headings:* **1. Ram jet 2. Dissociation in atmosphere 3. Ionospheric composition 4. Chemical energy in upper atmosphere.**—*NACA abstract.*

10.9–173 551.510.535:551.501.

Silberstein, R. (*National Bureau of Standards, Boulder, Colorado*), **The use of sweep-frequency backscatter data for determining oblique-incidence ionospheric characteristics.** *Journal of Geophysical Research*, Wash., D. C., 63(2):335–351, June **1958.** 12 figs., tables, 8 refs. **DLC**—The paper presents the results of comparisons of backscatter echoes, oblique-incidence pulse reception, and midpoint vertical-incidence echoes for a 2370-km path, following an earlier study for a 1150-km path. An attempt is made to find distinctive characteristics of those backscatter records that afford accurate values of MUF for the 2370-km path. Some sporadic intermediate-distance echoes are discussed, and some difficult night records are given. It is shown that present power and antennas are inadequate for obtaining F2-propagated echoes continuously, except on winter days. It is concluded that the sweep-frequency back-scatter technique is useful for obtaining maximum-usable-frequency data for instantaneous or prediction use over inaccessible areas, but that proper antennas and skilled personnel are very important. *Subject Heading:* **1. Ionospheric measurement techniques.**—*Author's abstract*

RADIO PROPAGATION

See also: **Radio climat. meetings** (Bean), **10.9–71**; **Ionospheric reflection** (Srivastava), **10.9–318.**

10.9–174 551.510.62:621.39

Barsis, A. P.; Bean, B. R.; Herbstreit, J. W.; Hornberg, K. O. and Norton, K. A., **Propagation of radio waves over land at 1046 Mc.** *U. S. National Bureau of Standards, NBS Report* No. 3520, Jan. 1, **1955.** Supplement 6. 13 p. 15 figs. (incl. photos), 14 refs., 6 eqs. **DWB**—The Air Navigation Development Board initiated an investigation of radio wave propagation in the 960–1600 Mc frequency band and placed the supervision of the project under the Central Radio Propagation Laboratory of the National Bureau of Standards. This report deals directly or indirectly with how such radio wave propagation bears on the problem of air-to-ground communications. Its purpose is to present the experimental data on 1046 Mc obtained for such radio navigation at Cheyenne Mountain Field Station for the period of Feb. 1, 1951 through Jan. 31, 1953. It includes the analysis of diurnal and seasonal variations in instantaneous signal levels, of the prolonged space-wave fadeouts and of the scattered signals at points far beyond the radio horizon. Other items included are: the estimates of effective gains of large antenna arrays, the spacing necessary for diversity arrays, the effective intelligence that bear bandwidths of the propagation paths, and a presentation of an analysis of t

"obstacle gains" expected at 1000 Mc in mountainous terrain. *Subject Heading:* **1. Tropospheric radio wave propagation.**—*N.N.*

10.9–175 551.510.62:621.396

Bean, Bradford R., **Survey of the National Bureau of Standards' application of atmospheric refractivity measurements to radio propagation studies.** *U. S. National Bureau of Standards, NBS Report*, No. 5007, Aug. 20, **1956.** 12 p. 4 figs., table, 19 refs. **DWB** (621.384 U585su)—The N and ΔN applications are reviewed and author then goes on to discuss briefly the work and program along the same lines as conducted by U. S. Bureau of Standards. Part of this work is the compression of data to punched cards such as: 10 years observations every two hours at 54 U. S. weather stations, world-wide distribution of refractivity and other investigations on N-climatology. *Subject Headings:* **1. Atmospheric refraction data 2. Radio wave propagation studies.**—*W.N.*

10.9–176 551.510.62:551.593.1

†Bean Bradford R. and Thayer, G. D., **On models of the atmospheric radio refractive index.** *U. S. National Bureau of Standards, NBS Report* 6025, Nov. 21, **1958.** 35 p. 19 figs., 3 tables, 23 refs., 30 eqs. **DWB** (621.384 U585onm)—Evaluation of atmospheric refraction effects on UHF-VHF radio propagation has long been accomplished with the convenient four-thirds earth concept of SCHELLING, BURROWS, and FERREL. This method has proven particularly useful in evaluating performance of point-to-point radio communications systems. However, relatively new long-range applications have demanded a model of atmospheric radio refractive index more representative of observed refractive index profiles than the simple linear decay inherent in the four-thirds earth approach. This paper introduces two models of atmospheric radio refractive index which can be used to predict refraction effects from the value of the refractive index at the transmitting point. Both models offer considerable improvement over the four-thirds earth model. A new method of predicting radio ray refraction at very low initial elevation angles is introduced which utilizes both the initial value and the initial height-gradient of the refractive index over roughly the first 100 meters above the earth's surface. This method, which is dependent only upon the first two radiosonde reporting levels or simple tower measurements of the common meteorological elements, results in a considerable improvement of the values of ray-refraction predicted by the model. *Subject Heading:* **1. Refractive index models.**—*Authors' abstract.*

10.9–177 551.510.62:621.396

Bean, Bradford R., **On the climatology of ground-based radio ducts.** *U. S. National Bureau of Standards, NBS Report* 6029, Dec. 4, **1958.** 14 p. 7 figs., 3 tables, 6 refs., 18 eqs. **DWB** (621.384 U585onc)—An atmospheric duct is defined to occur when geometrical optics indicates that a radio ray leaving the transmitter and passing upwards through the atmosphere is sufficiently refracted that it is traveling parallel to the earth's surface. Maximum observed incidence of ducts was determined as 13% in the tropics, 10% in the arctic and 5% in the temperature zone by analysis of three to five years of radiosonde data for a tropical, temperate, and arctic location. Annual maximums are observed in the winter for the arctic and summer for the tropics. The arctic ducts arise from ground based temperature inversions with the ground temperature less than −25°C while the tropical ducts are observed to occur with slight temperature and humidity lapse when the surface temperature is 30°C and greater.—*Subject Heading:* **1. Radio transmission ducts.**—*Author's abstract.*

10.9–178 551.510.62:551.551:551.576.11

*Braham, Roscoe R., Jr.; Harrington, Edward L. and Hoffer, Thomas E., **Cloud refractive index studies, Pt. 2, Use of distributions of ΔN vs. ΔS for estimating mechanical turbulence.** Chicago Univ. Dept. of Meteorology, Contract AF 19(604)-1931, Technical Note, No. 17, Sept. 2, **1958.** 18 p. 8 figs., 2 refs., eq. (Appendix: numerous tables.) **DWB**—An analysis has been made of fine structure variations of refractive index in and around a group of about 70 cumulus clouds with a view toward relating these variations to mechanical turbulence parameters. Frequency distributions of refractive index gradients were prepared for each level of flight for clear air, cloud core and regions of transition at the cloud boundaries. Similar

distributions were prepared for refractive index increments. The latter distributions, in the form of tables of N change vs. gradient size (ΔS), are presented as an appendix. From these distributions a parameter analogous to the "mixing length" of early turbulence theory was computed. This study shows that eddies of the transition regions of cumulus clouds have dimensions of a few tens of meters and are carried for distances of the order of 30–50 m before losing their identity. Mixing lengths of clear air eddies are much larger than those of cloud eddies, except, possibly, for those eddies in the uppermost parts of the clouds. *Subject Headings:* **1. Refractive index in clouds 2. Turbulence in clouds 3. Convective cloud structure.** —*Authors' abstract.*

RADIOACTIVITY

See also: **Auroral absorption** (Lied), 10.9–316.

10.9–179 551.510.7:551.577.7

†Lal, D.; Malhotra, P. K. and Peters, B. (*all, Tata Inst. of Fundamental Research, Bombay*), **On the production of radioisotopes in the atmosphere by cosmic radiation and their application to meteorology.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 12(4):306–328, 1958. 9 figs., 6 tables, 55 refs., 7 eqs. **DLC**—Cosmic radiation produces, in the atmosphere, various radioisotopes which are efficiently collected during the condensation of moisture and can be detected in rain-water. The production rates of various radioisotopes, mainly those whose half-lives make them suitable for studying meteorological phenomena, have been calculated for all parts of the atmosphere, and are presented in graphical form. For the isotope, ^{10}Be whose half-life is long compared to the characteristic time of mixing between the stratosphere and the troposphere, the fall-out rate agrees with the calculated production rate. For the isotopes, ^{7}Be, ^{33}P, and ^{32}P, whose half-lives are short compared to the characteristic time of mixing between the stratosphere and the troposphere, the measured fall-out rates agree with the calculations, provided one assumes that (a) only the activity produced in the troposphere appears in rain-water and contributions from air irradiated in the stratosphere are comparatively rare, (b) the mean period, between successive removals of radioisotopes from air masses, is about 1 month. Tentative measurements on the fall-out of ^{35}S activity indicate an appreciably higher rate than calculated. It is shown that the relative concentrations of any two radioisotopes with appreciably different half-lives, in a particular rain, do not depend on the local meteorological conditions, but only on the latitude and altitude at which the air mass was irradiated and can therefore be used as labels to trace the history of air-masses. The study of such isotope ratios in individual precipitations can, therefore, lead to useful meteorological information. *Subject Headings:* **1. Cosmic ray radio isotopes 2. Radioactive rainwater.**—*Authors' abstract.*

10.9–180 551.510.4

Thiry, H., **Contribution à l'étalonnage des radioéléments: mesure de périodes radioactives.** [Contribution to the rating of the radioelements: measurement of the radio-active periods.] *Société Royale des Sciences de Liége, Bulletin*, 26(1):29–39, Jan. 17, 1957. 5 figs., 5 refs.—Measurement of the still little known periods of some radio-elements. The measurements of activity are made with a Geiger-Muller counter and are referred to the activity of a standard of the Uranium oxyde. The periods are computed from the die-away curve of the radio-active element through the method of least squares. The activity of several samples was followed up for about 100 days. The following values are the statistical means of two measurements:

$$^{203}Hg: T = 47.1 \pm 0.2d; \quad ^{16}Tb: T = 73.0 \pm 0.5d; \quad ^{110}Ag: T = 253 \pm 4d.$$

The period of ^{45}Ca results from three measurements and is worth 153 ± 2 days. The period of ^{185}W, at last, has been found to have the value 70.0 ± 0.8 days. *Subject Heading:* **1. Radioactivity, half-life measurements.**—*A. V.*

10.9–181 539.16:551.510.72

Vohra, K. G.; Shirvaikar, V. V. and Rangarajan, C. (*all, Atomic Energy Estab., Trombay, Bombay*), **Radioactive fallout measurements made in India during 1956–1957.** *India*

Journal of Meteorology and Geophysics, Delhi, 9(4):333–340, Oct. **1958.** 6 figs., 2 tables, 11 refs. **DWB, DLC**—Since the first nuclear explosion nearly thirteen years ago, the U. S., Britain and Russia have been exploding nuclear weapons with great frequency. It has been estimated that since the first explosion, nearly a hundred and fifty nuclear weapons of various types and sizes have been exploded to date. Except for the two bombs that were dropped over Japan, all the other tests have been conducted at completely isolated spots which are far away from human habitation, and hence the question of hazards resulting from such explosions in their immediate vicinity does not arise. The main radiological hazard arising from these test explosions is from the phenomenon called fallout. As is well known, a nuclear explosion produces extremely large quantities of radio-active fission products. The extent of radiological hazard arising from any fission product depends upon (1) its relative abundance, (2) its radioactive half-life, (3) its biological half-life, (4) its probability of entry into the body and (5) its preferential accumulation in particular organs of the body. The main fission products that merit consideration from the point of view of radiological hazards are strontium 89 (half-life 53 days), strontium 90 (half-life 28 days), iodine 131 (half-life 8 days), cesium 137 (half-life 33 days), barium 140 (half-life 13 days) and cerium 144 (half-life 282 days). Another radioisotope which should be considered in this connection is the plutonium 239 (half-life 2.4×10^4 years) which may be left behind in an explosion without undergoing fission. *Subject Heading:* **1. Radioactive fallout.**

10.9–182 551.510.7 551.510.41

Skorka, S. (*Hamburg Univ. Inst. of Physics*), **Messungen der Luftradioaktivität während einer Seereise nach Australien.** [Measurements of atmospheric radioactivity during a sea voyage to Australia.] *Atomkernenergie*, Munich, 3(5):182–186, May **1958.** 7 figs., eqs. English summary p. 182. **DLC**—A filter paper collection method was used to measure natural and artificial radioactivity of air during a voyage from Europe to Australia during the months Sept. 1956 to Jan. 1957. The mean concentration of fission products was $3.6\times10^{-12}\mu C/cm^3$ of air. The maximum value $124\times10^{-12}\mu C/cm^3$ was obtained in Sydney 3 days after an atomic bomb explosion some 1000 km away. The mean radon content during the same period was $27\times10^{-12}\mu C/cm^3$. Unusually high contents of thoron were found along the eastern and southern coasts of Australia. *Subject Headings:* **1. Radioactivity in the atmosphere 2. Radon content of atmosphere 3. Pacific Ocean.**—*Author's abstract.*

10.9–183 551.510.721

Spode, E. (*Inst. f. Medizin und Biologie, Deutsche Akademie der Wissenschaften zu Berlin-Buch*), **Über die Möglichkeiten einer Verbreitung radioaktiver Spaltprodukte durch Kernwaffenversuche.** [Hazards of radioactive fallout due to nuclear weapon tests.] *Die Technik*, Berlin, 12(10):696–699, Oct. **1957.** 3 tables, 16 refs. **DLC**—Problems of worldwide contamination with nuclear fission products are reviewed in a concise manner. Among the particular problems discussed are: 1) composition and amount of fission products produced in a nuclear explosion, 2) meteorological factors (especially the global transport of atomic debris by the jet stream), 3) measurements of fallout (especially I-131 and Sr-90) made in different countries, and 4) possible biological effects. *Subject Heading:* **1. Radioactive fallout.**—*G.T.*

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

See also: **Aerodynamics theory** (Mises), 10.9–8; **Thermodynamic met. texts.** (Rakipova), 10.9–9; **Numerical forecast. and adiabatic processes** (Smagorinsky), 10.9–153; **Atmos. models and radiative equilib.** (Krook, Pecker), 10.9–212; **Heat bal. of atmos.** (Miyakoda), 10.9–219; **Advection of rel. isohypses** (Doumont), 10.9–235.

10.9–184 551.511:551.557.3

Bates, Ferdinand C., **Report on effect of the random vector wind error on the accuracy of measurement of horizontal divergence.** Kansas City, Mo., U. S. Weather Bureau, **1956.** 9 p. 7 figs., 4 tables, 2 refs., 29 eqs. Reproduced from typescript. **DWB** (M57.3 U587r)—A case study is made of the feasibility of using observed winds to compute the horizontal

divergence in planes in the atmosphere from the standpoint of instrumental and observational error effects. No definite results could be obtained because of observational errors. *Subject Heading:* **1. Horizontal divergence computation accuracy.**—*N.N.*

10.9–185 551.511.32

†Pfeffer, Richard L. (*Geophysics Res. Directorate*), **On the design of a numerical experiment for the study of the general circulation of the atmosphere.** (In: Massachusetts Institute of Technology. Dept. of Meteorology, Contract AF 19(604)-1000, Final Report, Dec. 31, **1957.** p. 414–449. 3 figs., 22 refs., 50 eqs.) **DWB**—A two parameter quasi-geostrophic model is derived, which incorporates effects of differential heating and friction as well as the vertical advection of vorticity and the turning of the vortex tubes from the horizontal into the vertical. A spherical coordinate system, with pressure as the vertical coordinate, is used in the derivation, and the model is applied over the Northern Hemisphere from 15°N to 80°N lat. The two parameters used to describe the flow are the geopotential height of the 700 mb and 200 mb surfaces. The resulting model can be used as a basis for conducting "controlled" numerical experiments (much like the physical experiments of FULTZ) in which each of the external parameters (e.g. heating, rotation, viscosity) is varied in a specified manner in order to determine how this general circulation of the atmosphere would react to a variety of natural and artificial stimuli. The design of the first in a series of such experiments is discussed. *Subject Headings:* **1. General circulation studies 2. Numerical models.**—*Author's abstract.*

10.9–186 551.511.32

Pfeffer, Richard L. (*Geophysics Res. Directorate*), **On the physical significance of energy transformation functions.** (In: Massachusetts Institute of Technology. Dept. of Meteorology, Contract AF 19(604)-1000, Final Report, Dec. 31, **1957.** p. 42–65. 4 figs., 6 refs., 34 eqs.) **DWB**—In this article sufficient conditions are determined under which integrals in the energy equations may be interpreted as rates of conversion between two forms of energy. It is shown that the appearance of an integral in two different energy equations, with opposite signs, is not a sufficient condition that it represent a rate of energy conversion. This is because it is usually possible to recombine terms such that a different integral appears in the same two equations with opposite signs. Each different combination of terms in the energy equations would, therefore, imply different rates of conversion among the various forms of energy. The conditions determined in the present article (on physical grounds) make it possible to determine, uniquely, the direction and magnitude of the energy conversions which take place in any given fluid system. *Subject Headings:* **1. Energy transformation 2. Energy equations**—*Author's abstract.*

10.9–187 551.511.33:551.558.

Baev, V. K., **Nestatsionarnye konvektivnye techeniia.** [Nonstationary convective currents.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, No. 43(70):3–18, **1956.** 9 figs., ref., numerous eqs. **DWB, DLC**—A theoretical mathematical analysis of the nonlinear nonstationary problem of free convection arising from a state of rest under the influence of a non-homogeneously heated surface. Mathematically this problem involves the solution of a system of equations of convection for a given temperature distribution over an underlying surface. In the differential equations of convective motion the fluid is assumed to be quasi-stationary and density varies with temperature. The complete solution of the problem is presented. A more general solution is developed for the case where the known magnitude of the heat balance at the earth's surface replaces the temperature of the underlying surface, the problem is solved in two layers (atmosphere and soil) and is then combined with limiting conditions. On the basis of the derived formulas for velocity and temperature calculations are made for constructing lines of flow, and temperature and velocity graphs corresponding to different distributions of temperature of the underlying surface. *Subject Headings:* **1. Convective currents 2. Convective motion.**—*I.L.D.*

10.9–188 551.511.33:536.75:551.509.

Bagrov, N. A., **Statisticheskaia entropiia kak mera neopredelennosti i sviazannost' sluchaĭnykh iavleniĭ.** [Statistical entropy as a measure of the uncertainty and relativi

of random phenomena.] *Meteorologiia i Gidrologiia*, Leningrad, 9:43–48, **1957.** 2 tables, 16+eqs., 9 refs. **DWB, DLC**—The undeterminacy of our knowledge regarding the occurrence of an event is greatest when the chances of the occurrence of several events are equally possible. Recently information theory has developed a special index of the undeterminacy of random events. The equation of statistical entropy of a complete system developed in information theory, $H(x)=H(P_1, P_2, \ldots P_n): -\sum_{k=1}^{n} P_k \lg p_k$. The equation of entropy for the case where a random event has a continuous distribution of probability is presented, namely: $H(x)=-\int_{-\infty}^{\infty} P(x) \lg p(x)dx$. The application of the entropy equation to meteorology in forecasting the occurrence of an event with particular reference to long range forecasting, to calculating the probability of occurrence in case of dependent events is illustrated with the aid of the required formulae. Specific calculations of the index of stochastic relationships are illustrated and the actual and forecast temperature anomalies at Moscow over a given period, etc. The possible application of statistical entropy and the concepts of information theory to meteorology are discussed. *Subject Headings:* **1. Entropy 2. Long range forecasting.**—*I.L.D.*

10.9–189 551.511.33:551.571.7

Bogdanova, N. P., **Teoriia nezonal'nogo raspredeleniia vlazhnosti v atmosfere dlia kholodnogo vremeni goda.** [Theory of non-zonal atmospheric humidity distribution during the cold season.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 71:94–102, **1957.** 5 figs., 3 refs., 34 eqs. **DWB** (M(055) U581tG)—The distribution of humidity in the atmosphere is primarily zonal in nature, since zonality is considerably stronger aloft. Accordingly a quantitative theory of moisture transport in the atmosphere will be based upon the presence of zonality and the distribution of humidity disturbed by meridional incursions. The fundamental equation of moisture transport is

$$\frac{V_\theta}{a}\frac{\partial q}{\partial \theta} + \frac{V_\theta}{a \sin\theta}\frac{\partial q}{\partial \psi} + V_z \frac{\partial q}{\partial z} = \frac{\partial}{\partial z} k \frac{\partial q}{\partial z} + \frac{A}{a^2 \sin\theta}\frac{\partial}{\partial \theta} \sin\theta \frac{\partial q}{\partial \theta} - \epsilon.$$

This equation is solved by the method of successive approximation. In the first approximation the flow of water vapor and the horizontal mixing of air are not taken into account. Equations are derived for investigating the effect of evaporation from the oceans, upon the distribution of moisture over the continents and the solutions of these equations give the distribution of water vapor when latitudinal components of wind velocity, vertical wind velocity and turbulent exchange are considered. An example giving the distribution of water vapor for the earth's surface for 1 km is presented. The solution of a nonhomogeneous equation, in order to evaluate the meridional transport of moisture is presented. And numerical results giving the distribution of moisture for the earth's surface at 0.5, 1.0 and 1.5 km are presented. It is concluded that vertical velocity substantially influences the distribution of moisture. *Subject Headings:* **1. Moisture transport 2. Humidity distribution 3. Zonal distribution of humidity.** —*I.L.D.*

10.9–190 551.511.33:551.511.6:536.24

Greenfield, Harvey, **Atmospheric heat transfer problem with eddy diffusivity varying as a power law with height.** *U. S. Dugway Proving Ground, Utah, DPGR*, No. 200, Oct. **1957.** 00 p. 6 figs., 4 tables, 21 foot-refs., 119 eqs. **DWB**—A period convective heat flow solution is presented in which the boundary temperature at the soil-air interface varies sinusoidally with time while the eddy diffusivity is postulated to vary sinusoidally with time and as a power law with height. The heat transfer differential equation and boundary values were simplified by transformations and separation of variables. This in turn led to an exponential function in time and an eigenvalue problem. The orthogonality properties of eigenfunctions suggested the use of STODOLA'S method with set boundary conditions to form an iteration device. This resulted in recurrence formulas for approximations to numerical results. The height and the power law were varied in unit increments, and the values were inserted into the recurrence formulas which were programmed for numerical analysis on an electronic computer. Approxi-

mations to eigenvalues and resulting eigenfunctions led to a series solution of the mean temperature in the vertical with a time term included. *Subject Headings:* **1. Heat transfer 2. Eddy diffusivity.**—*Author's abstract.*

10.9–191 551.511.6

Saissac, Joseph, **Sur la diffusion atmosphérique des particules.** [The atmospheric diffusion of particles.] *Académie des Sciences, Paris, Comptes Rendus,* 247(17):1371–1374, Oct. 27, **1958.** 3 figs., 4 refs., 6 eqs. **DWB, DLC**—Checking by way of experiment, through a photometric method, of O. F. T. ROBERTS' equation, expressing the concentration X at each point

$$X(x, y, z) = \frac{Q}{4\pi x(Ky, Kz)^{\frac{1}{2}}} \exp. \left[- \frac{\bar{u}}{4x} \left(\frac{y^2}{Ky} + \frac{z^2}{Kz} \right) \right]$$

the coordinates x, y, z being defined on an axes system, the origin of which coincides with the source, where the Ox-axis is parallel to the mean wind (horizontal) with modulus $\bar{u}$ and where the Oz-axis is vertical. Q is the output of the source; Ky and Kz, the diffusivities relating to the respective directions Oy and Oz, are constants. This expression has been obtained in the case of a homogeneous and anisotrope diffusion of particles emitted through a quasi pin-point source with constant output, situated at a given height above the ground. For his experiment the author uses smokes emissions produced by the combustion of a compound containing its own fuel in order to give an output practically independent of the irregular supply in natural oxygen. *Subject Headings:* **1. Atmospheric diffusion 2. Photometric method 3. Point source diffusion.**—*A. V.*

GENERAL CIRCULATION

See also: **500 mb jet stream, N. Hemisphere** (Bayer), 10.9–134; **Rotating dishpan and jet stream models** (Sheppard et al.), 10.9–239.

10.9–192 551.513:523.7

Berkes, Zoltán, **Újabb eredmények a naptevékenység változása és az általános légkörzés kapcsolatának vizsgálata terén.** [Recent progress in the research of the relation between solar activity variations and the general circulation.] *Időjárás,* Budapest, 61(3):208–209, May/June **1957.** 5 refs. **DLC**—Recent studies of the effect of short period solar variations upon the general circulation by VISSER (1954), RODEWALD (1955), BAUR (1955), and IRENKL (1957) are reviewed and found to confirm the opinion of Hungarian investigators that the general circulation of the atmosphere is definitely and appreciably affected by short period variations in solar activity. *Subject Headings:* **1. Solar effects on general circulation 2. Solar variations.**—*G. T.*

10.9–193 551.513:551.577.38:551.58

Dzerdzeevskiĭ, B. L., **Znachenie analiza obshcheĭ tsirkuliatsii atmosfery pri ustanovlenii granits sukhikh i vlazhnykh oblasteĭ.** [Use of atmospheric general circulation analysis in determining the boundaries of dry and humid regions.] (In: Vsesoiuznoe Geograficheskoe Obshchestvo SSSR, **Voprosy Geografii.** Moscow, **1956.** p. 147–152. 9 refs.) **DWB, DLC** (G58.G35) Trans. into French issued in French Language ed., **Essais de Géographie,** Moscow, **1956.** p. 150–156. fig., 9 refs. Abstracted from separate pages. **DWB**—A theoretical article in which the author shows that the study of atmospheric macrocirculation, as one of the most important climate forming factors, is an indispensable condition for describing the origin of dryness of the climate, and the peculiarities of its distribution on the earth's surface. Not only the description of the origin of dryness, but also the delineation of dry regions, and the study of their constancy, must be carried out with the aid of a complete analysis of circulation processes. *Subject Headings:* **1. General circulation studies 2. Climatic effects of large-scale circulation 3. Synoptic climatology.**—*A. M. P.*

10.9–194 551.513(26

Estoque, Mariano A. (*Weather Bureau, Manila*), **Circulation and convergence over the tropical Northwestern Pacific from May to December.** *Pacific Science Congress, 8th, Quez*

City, Philippines, Nov. 1953, *Proceedings*, Vol. IIA, pub. **1956.** p. 1031-1085. 28 figs., 3 tables, 5 refs. **DWB**—An attempt is made to determine "the wind field which accompanies tropical and important synoptic situations in the Tropical Northwestern Pacific, to investigate the Intertropical convergence zone, and to ascertain the degree of correlation between the field of motion and the weather." The study is based upon observations made during 1950 and 1951 and cover the period of the entire summer monsoon up to the start of the winter monsoon. The principal air streams, the flow pattern, convergence lines and the weather associated with convergence lines are analyzed. Tables giving the mean properties of the North Pacific Trade Stream, of the Indian Northeasterlies and of the Northeast monsoon area, the northern Philippines, soundings, synoptic charts, etc., are included. *Subject Headings:* **1. General circulation over Northwestern Pacific 2. Convergence studies 3. Northwest Pacific.**—*I.L.D.*

10.9–195 551.513

Gerson, N. C. (*Geophysics Research Directorate, Air Force Cambridge Research Center*), **General circulation of the high atmosphere.** *Journal of Geophysical Research*, Wash., D. C., 61(2, Pt. 2):351–353, June **1956. DLC**—Six factors responsible for the accelerations of the atmospheric fluid are discussed in this summary report on the preliminary deductions concerning the planetary circulation at high altitudes. Forces acting on the fluids in the ocean or in the troposphere are also considered to act on the gas in the ionosphere. But in the latter case it is subject to further restraints and forces. *Subject Headings:* **1. Planetary circulation 2. Fluid dynamics.**—*N.N.*

10.9–196 533.7:551.513(98)

Godson, W. L. and MacFarlane, M. A., **Pressure-contour variance and kinetic energy over the Arctic.** McGill Univ. Arctic Meteorology Research Group, AF 19(604)-1141, Scientific Report No. 5, Publication in Meteorology No. 7, March **1958.** 49 p. 11 figs., 6 tables, 16 refs., 71 eqs. **DWB** (919 M145s)—The theoretical relationship between the space variance of height and the space variance of the geostrophic wind was tested in the Arctic at 500 mb. As had been expected, a high correlation was found to exist between these two quantities although the form of the relationship (linear in the logarithms of the standard deviations of height and wind) was unexpected. The Arctic data from the previous papers, concerned with the relationship between the time variances of height and wind, were then reanalysed and the relationship between them was found to be of the same form as that for the space variances. In both cases the standard error of estimate was too large to be able to calculate accurately the wind variance from the height variance, but the relationships do allow climatological estimates to be made of the mean kinetic energy and of the size of the dominant wave systems. *Subject Headings:* **1. Kinetic energy in atmosphere 2. Arctic air circulation 3. General circulation 4. Arctic.**—*Authors' abstract.*

10.9–197 551.513:551.583.14:551.590.21

†Gregor, Zdeněk (*Hydrometeorological Institute, Prague*) and Krivsky, Ladislav (*Astronomical Inst., Ondrzhenov*), **Mnogoletnee izmenenie tsirkuliatsii Atlanticheskо-Evropeĭskoĭ oblasti v sviazi s sekuliarnoĭ solnechnoĭ deiatel'nost'iu.** [Long period circulation variations in the Atlantic-European Area and their relation to secular solar activity.] *Geofysikální Sborník*, Prague, No. 62; **1957.** 51 p. 12 figs., 4 tables, 94 refs. German and Czech summaries p. 38–46. English trans. by Valys Zilius issued by American Meteorological Society under Contract AF 19(604)-1936, Sept. **1958.** 55 p. Review by Berkes, Zoltán, **A cirkuláció ellegének szekuláris változása.** [Secular variations of the character of circulation.] *Időjárás*,. Budapest, 62(3):175–176, May/June **1958. DLC**—Using the same method as in a previous study (*see* 8.1–199, Jan. 1957, *MAB*) the authors draw charts showing changes in the position of frontal zones in January, April, July and Oct. from 1899 to 1939 and from 1920 to 1939, as compared to 1900 to 1919. They also make an extensive review of world literature on circulation changes as related to climatic changes and to solar activity and conclude that long-period variations in circulation and in climate are related to each other and are caused by secular changes in solar activity. *Subject Headings:* **1. Long period circulation variations 2. Secular solar activity variations 3. Solar-climatic relationships.**—*G.T.*

ATMOSPHERIC DISTURBANCES

See also: **Typhoon texts.** (Arakawa), 10.9–11; **Weather lore, Texas** (Boatright et al.), 10.9–30; **Thunderstorm safety flights** (Voskanov et al.), 10.9–109; **Frontal eff. in numerical forecast.** (Sadokov), 10.9–152; **Isohypses and winter monsoons, Asia** (Lapeyre), 10.9–227.

10.9–198 551.515.1/2:551.46(798)

Burt, Wayne V. (*Lt. Comdr. USNR-R*), **Can mid-latitude storms be as severe as tropical typhoons and hurricanes?** *U. S. Naval Institute, Proceedings*, 84(6):127–132, June **1958**. 2 figs., 5 foot-refs. **DWB**—Both theoretical considerations and observations of waves in extra-tropical cyclones indicate that such storms occasionally produce waves higher than those in tropical storms. The longer fetch and time that gale winds blow over the mid-latitude storm wave rains more than make up for the higher maximum winds in hurricanes. A 45 kt wind may blow over a fetch of 300–500 mi compared with 40 or 50 mi for a hurricane. This can generate waves of >40 ft compared with 35 ft for a hurricane (occasional waves 10 ft higher may result from superimposed waves). A study of severe cyclones (9 or more hrs of 25 ft waves) in the Gulf of Alaska shows that they may occur 2–3 times a winter (ranging from none to 10 a year), and very severe (9 or more hrs of 35 ft waves) storms less than once a year with half of the winters having none. *Subject Headings:* **1. Hurricane waves 2. Cyclone waves 3. Severe extratropical cyclone frequencies 4. Gulf of Alaska.**—*M.R.*

10.9–199 551.515.1:550.34

Bernard, Pierre (*Institut de Physique du Globe de Paris*), **L'agitation microséismique en Normandie.** [Microseismic activity in Normandy.] *Annales de Géophysique*, Paris, 12(2):151–156, **1956**. 4 figs., 6 foot-refs. (English summary p. 151.) **DLC**—Microseism activity at Evreaux is compared with the location of lows in northwestern Europe. The microseismic activity and swell observations in Morocco seem to be related. Results are compared with observations recorded at Paris, Uccle, Kew and De Bilt. *Subject Headings:* **1. Microseisms 2. Evreaux, France 3. Europe.**—*A.A.*

10.9–200 551.515.1:551.558(764)

Deardorff, James W., **The spatial distribution of vertical motion within a mature cyclonic vortex.** Washington (State). Univ. Dept. of Meteorology and Climatology, Contract AF 19(604)-314, Occasional Report, No. 6; Scientific Report No. 3, Jan. **1957**. 46 p. 21 figs. 17 refs., 9 eqs.—Investigations of a cyclonic vortex and the vertical motions within it, using 3 methods: 1) adiabatic method, 2) vorticity method, and 3) the kinematic method, are set forth, including theory, results of study of vortex of April 1, 1955 in the south central U. S. discussion of errors for each method (both qualitative and quantitative) which increase rapidly with height from 5500 ft to 30,000 ft. Previous calculated maximum values of vertical velocity using the adiabatic method (average of 12 hrs) were 8 cm/sec at 300 mb; by the vorticity method (6 hourly averages) 9 cm/sec at 700 mb; and by the kinematic method (instantaneous) >10 cm/sec at 5000 ft. In this study values of 10 cm/sec were computed at the 18,000 ft level, 15 cm/sec at 24,000 ft and 20 cm/sec at 30,000 ft; by the adiabatic method. Vertical velocity charts for 5500, 10,000, 18,000, 24,000, and 30,000 ft are included. A cellular pattern was noted at 50,000 feet. *Subject Headings:* **1. Vertical velocities in cyclones 2. Cyclone, Texas (April 1955) 3. Cyclonic vortexes.**—*M.R.*

10.9–201 551.515.1

†Kühn, Udo (*Betriebslabotorium für Rundfunk und Fernsehen, Kolberg*), **Die kalten Höhenzyklonen der Nordhalbkugel.** [The cold high level cyclones of the Northern Hemisphere] *Beiträge zur Geophysik*, Leipzig, 65(3):246–262, **1956**. 18 figs., 48 refs. **DLC, DWB**—The regions where, in each separate month of the year, cold upper cyclones develop over the Northern Hemisphere, are shown on charts and discussed. Baffin Land and Eastern Siberia are the areas most frequented by these cold lows (which frequently drift over Southern Europe and less frequently into the SW of the U. S.). The greatest number occur in late spring, early summer, and autumn—the fewest in winter. Typical surface pressure situations accompanying

y upper cold lows are also studied and illustrated. Data on frequencies are presented in orm of histograms. *Subject Headings:* **1. Cold lows aloft frequencies 2. Northern Hemisphere.**—*M.R.*

10.9–202 551.515.11:551.515.71

§Reshetov, V. D., **Analiz dvukh sluchaev tsiklo- i antitsiklogeneza.** [Analysis of two cases f cyclogenesis and anticyclogenesis.] *Moscow. Tsentral'naia Aerologicheskaia Observatoriia, Trudy,* No. 23:3–15, **1957.** 11 figs., 1 table, 3 refs. **DLC**—Vorticity theory explains the rigin of cyclones and anticyclones and the motions of certain cyclones and anticyclones that annot be explained by frontal wave or convergence-divergence theory. It does not, however, xplain in physical terms how a vortex, or the Laplacian of pressure of the upper layer characterzed by insignificant stores of energy being transformed downward according to the barometric ormula, sometimes produces a marked effect on the variation of the pressure at the surface nd the movement of large air masses. Two examples of cyclo- and anticyclogenesis are nalyzed showing that the mechanism of downward transfer of a disturbance aloft (Laplacian ressure) or vortical velocity is accomplished in a more complicated manner than according o the barometric formula. A synoptic analysis showed that the force of friction in the tmosphere plays an active role in the formation of pressure at the surface of the earth. In he case of cyclogenesis, the presence of large forces of turbulent exchange brings about the ownward transfer of cyclonic circulation of the upper layer and the formation of a cyclonic ressure field at the surface; in the case of anticyclogenesis, as a result of slight turbulent xchange there is a downward transfer of the circulation of the upper layers. Accordingly, wing to the gradual loss of energy of movement of the upper layers in the overcoming of rictional forces, the upper cyclonic system is filled up, a mass of air flows into the region of the pper quasistationary cyclone, pressure at the surface increases and an anticyclone is formed. *Subject Headings:* **1. Cyclogenesis case histories 2. Anticyclogenesis 3. Synoptic studies.** —*I.L.D.*

RADIATION AND TEMPERATURE

RADIATION

See also: **Solar radiation obs. manuals, 10.9–38; Ultraviolet absorption in upper atmos. (Watanabe), 10.9–141; Auroral radiation and cosmic ray origin, 10.9–313.**

10.9–203 551.521.17:551.521.31:535.34

Astoin, N.; Johannin-Gilles, A.; Granier-Mayence, J. and Romand, J. (*all, Natl. Cen. or Scien. Res., Bellevue, France*), **Some data on the absorption spectra of gaseous N_2O, NO nd H_2O in the extreme ultra-violet.** (In: **The threshold of space,** ed. by M. Zelikoff. N. Y., ergamon Press, **1957.** p. 136–142. 4 figs., 26 refs., eqs.) **DLC**—Absorption curves are hown in the region 150–1000 Å for N_2O, NO and gaseous H_2O. A grating spectrograph with rating incidence (86°) was used. The resulting band systems, superimposed upon a conuous spectrum in each case, are discussed. A special analysis was made for H_2O between 600 and 1700 Å. In this region the relation $D=K(pl)^{\frac{1}{2}}$ was found for the optical density f the absorbing layer, depending upon pressure p and length l, which is not in agreement ith the Beer-Lambert law, probably due to lack of spectrographic resolution. No change f this spectrum was found by varying the irradiation intensity. For heavy water vapor imilar absorption curves were found with the exception of zone shifts toward shorter wave engths. *Subject Headings:* **1. Absorption spectra 2. Ultraviolet absorption.**—*A.A.*

10.9–204 551.521.17:551.507.362.1

Behring, W. E.; McAllister, H. and Rense, W. A. (*all, Physics Dept. Colorado Univ.*), **ltraviolet emission lines in the solar spectrum.** *Astrophysical Journal,* Chicago, 127(3):676–79, May **1958.** 3 figs., 2 tables, 3 refs. **DWB, DLC**—Five spectrograms of solar ultraviolet adiation taken from a rocket on Aug. 6, 1957, led to information on wave lengths and halfidths of emission lines between 1032 and 1893 Å in the solar spectrum. Identification of

most of the emission lines with those previously observed was made. After allowance was made for instrumental broadening, the minimum half-widths of HL*a* and of the HeII line at 1640.5 Å, were established as 0.80 Å and 0.30 Å, respectively. *Subject Headings:* **1. Ultraviolet solar spectrum 2. Ultraviolet measurements 3. Rocket radiation data.**—*Authors' abstract.*

10.9–205 551.508.21:629.135 551.521.18

Lopukhin, E. A., **Izmenenie potokov izlucheniia v atmosfere nad Tashkentom pri iasnom nebe.** [Variations of the radiation flux in the atmosphere over Tashkent during a clear sky.] (In: Akademiia Nauk Uzbekskoĭ SSR. Institut Matematiki i Mekhaniki, **Meteorologiia i Gidrologiia v Uzbekistane.** Tashkent, **1955.** p. 11–21. 12 tables, 8 refs., 4 eqs.) **DLC**—The exchange of long wave radiation in the fall atmosphere over Tashkent was studied with an airplane equipped with two pyranometers—one directed upward and the other downward. The flights were made after sunset during the period May–Sept. 1954. The results of the measurements are given in tables containing observed and computed (for a given air temperature) values of the radiational flux of the atmosphere (E_A) and of the active layer for elevation from 0.4 to 7.0 km above sea level, values of E_A and E_B computed on the basis of temperature and moisture distribution at these elevations, the maximum and minimum differences between the mean observed (allowing for and not allowing for the effect of wind and temperature) and computed radiation fluxes of E_A and E_B, the effective radiation of a black surface ($E_T - E_A$) observed and computed $E_B - E_A$ and radiational cooling. The actual measurements on all the flights are presented. All values are given in cal/cm² min. Also data on the annual variations of E_A and E_B (monthly means of fixed hourly values), annual variation of the radiational heating θ of the air at fixed time of day, and on the relationship between long wave radiation in a solid angle upon the zenith angle. *Subject Headings:* **1. Radiation flux 2. Radiation heat exchange 3. Air-borne radiation measurements 4. Tashkent, U.S.S.R.**—*I.L.D.*

10.9–206 551.521.18:551.588.7:551.510.42

Yamamoto, Giichi (*Geoph. Inst., Tohoku Univ.*), **Estimation of additional downward radiation from aerosols over large cities.** *Meteorological Society of Japan, Tokyo, 75th Anniversary Vol. of the Journal,* pub. Nov. **1957.** p. 1–4. 2 tables, 16 refs., 7 eqs. **DWB, DLC**—Atmospheric pollution over large cities has been increasing rapidly in recent years, and some meteorologists believe that a downward radiation from aerosols plays a role of preventing nocturnal cooling in large cities. In fact, the presence of an additional downward radiation whose origin is other than H_2O and CO_2 was suggested by ROBINSON (1) by the analysis of radiation measurements made at Kew Observatory. However, later YAMAMOTO and SASAMORI (2) showed that the observed values of downward radiation at Sendai were in good agreement with the values computed by the Yamamoto radiation chart which treats H_2O and CO_2 as radiator. They also showed that isothermal emissivity cannot be determined uniquely from radiation measurements in the atmosphere by the ROBINSON or BROOKS (3) method, that is, higher values of isothermal emissivity were obtained in cases of inversion than in cases of no inversion for the same amount of H_2O and CO_2. In spite of our investigation as Sendai is a middle sized city without appreciable sources of air pollution, there still remains a question—whether the atmospheric pollution over large cities is really ineffective to long wave radiation or not. In the present paper the author has examined the problem from an entirely different point of view. *Subject Headings:* **1. Atmospheric pollution effect on cooling 2. Nocturnal cooling in cities 3. Urban effects.**—*Author's abstract.*

10.9–207 551.521.1

Houghton, J. T. (*Clarendon Lab., Oxford*), **The emissivity of the earth's surface.** *Royal Meteorological Society, Quarterly Journal,* 84(362):448–450, Oct. **1958.** table, 3 refs. **DWB, DLC**—Some measurements from aircraft of the emissivity of the earth's surface are described. They show that, for the type of surface studied, the earth's surface is radiating as a black-body at a temperature somewhere between screen air temperature and grass or sea-surface temperature. *Subject Heading:* **1. Terrestrial radiation.**—*Author's abstract.*

10.9–208 551.521.3:551.575.1:551.593.54

Arnulf, A. (*Inst. d'Optique, Paris*), and Bricard, J. (*Inst. de Geophysique, Paris*), **Transmission by haze and fog in the spectral region 0.35 to 10 microns.** *Optical Society of America, Journal*, 47(6):491–498, June **1957.** 14 figs., 4 tables, 11 foot-refs., eqs. **DWB, DLC**—Two ndependent methods were used: direct spectrophotometry through the transparent windows of the atmospheric gases, and measurement of the number and diameter of the water droplets, ollowed by a Mie-theory calculation of the spectral transmittance. Results from the two nethods are in good agreement when the media are sufficiently homogeneous, as for a quiet naze or fog and artificial smoke. The following kinds of atmospheres were considered: hazes (optical density per km in the visible spectrum is less than 2); a small number of small-drop ogs (optical density per km less than 10); evolving fogs (which have changing distributions of drop-diameters); nonevolving, slightly selective fogs; artificial smokes. In addition, some nformation is given on the statistical distribution of drop-diameters. It was found that the ransmission of haze increased markedly with increasing wavelength, from the visible to 10 nicrons, but this marked increase was not found for fogs. *Subject Headings:* **1. Fog transmission 2. Spectrophotometry 3. Mie Theory.**—*Authors' abstract.*

10.9–209 551.521.3:535.436

Batter, John F., Jr. (*Technical Operations, Inc., Burlington, Mass.*), **Transport calculation of the net current of photons in an isotropically-scattering atmosphere.** *Optical Society of America, Journal*, 48(6):371–374, June **1958.** 3 figs., 15 eqs. **DWB, DLC**—The net photon current is obtained from the exact transport solution for photon density in an infinite isotropic atmosphere. An analytical-numerical solution for the photon current is developed and presented graphically, together with the diffusion theory current versus nondimensional distance. *Subject Headings:* **1. Atmospheric scattering 2. Scattering by particles.**—*Author's abstract.*

10.9–210 551.521.3

Belov, V. F., **Issledovanie indikatris rasseianiia v troposfere i nizhneĭ stratosfere.** [Investigation of scattering indexes in the troposphere and lower stratosphere.] *Moscow. Tsentral'naia Aerologicheskaia Observatoriia, Trudy*, No. 23:63–77, **1957.** 6 figs., 2 tables, refs., 10 eqs. **DLC**—The equations for determining the dispersion index, which is obtained by measuring directly the brightness of the daylight sky at the almucantar of the sun or any other almucantar at different angular distances from the sun. The method is analogous to that used in astrophysics in measuring the scattering index for the entire atmosphere. In order to determine the absolute and relative coefficients of dispersion for the entire atmosphere of an area of the upper boundary of the atmosphere (solar constant), $m \simeq \sec z$, $m\odot \simeq \sec z\odot$ atmospheric masses in the direction corresponding to point of the sky and sun are considered. If the former is on the almucantar, then $Bz_\infty(h_0) = mE(h_0)\sigma_\beta(h)$. For determining the relative index of dispersion, some measurements of sky brightness at any almucantar are necessary so that

$$f(\beta) = \frac{\sigma_\beta(h_0)}{\frac{\sigma_\pi}{2}(h_0)} = \frac{B_z(h_0)}{\frac{B_\pi}{2}(h_0)}$$

and the average value of the coefficient of directed measurements of brightness from a clear sky is used. On the assumption that the atmosphere is flat, light refraction in the atmosphere and multiple dispersion and refraction of sunlight from the surface can be neglected. The brightness of a cloud-free sky B at X altitude h_0 above the surface of the earth in a direction formed by the angle β with the direction of solar radiation is given by

$$B_z(h_0) = E\odot^0 \frac{m}{m-m\odot} \frac{\sigma_\beta}{\tau} (P^{m\odot} - p^m)$$

where $E\odot^\circ$ = illumination perpendicular to the rays of the sun. Light scattering for a given atmospheric layer is given by

$$\sigma_\beta(h_0) - \sigma_\beta(h_0 + \Delta h) = \int_{h_0}^{h_0+\Delta h} \sigma_\beta(h)dh = \sigma_\beta.$$

The electrical circuit diagram of the recorder of the index of light dispersion during daylig hours and the construction of the apparatus are described with the aid of diagrams. Th results of measurements showed the following: the variations of the relative coefficient of ligh scattering for the angle of scattering $\beta = 25°$ are analogous to variations on the coefficient o asymmetry; a considerable increase in the asymmetry index is observed at the troposphere up to heights of 19 km the scattering index is still considerably extended anteriorly. *Subjec Headings:* **1. Scattering coefficient 2. Atmospheric scattering.**—*I.L.D.*

10.9–211 551.521.3(477.6

Berezina, L. S., **Izmerenie pogloshcheniia solnechnoĭ radiatsii v raĭone Odessy.** [Measur ing the absorption of solar radiation in the neighborhood of Odessa.] *Kiev, Ukraine. Ukrain skiĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, No. 8:128–135, **1957** 8 tables, 11 refs. **DLC** (Slavic)—The methods and results of measuring the absorption c solar radiation by simultaneous determination of the downward E↓ and upward E↑ radiatio intensity flows at .2, .5, 1.0, 2.0 and 5.0 km heights with the aid of two Ianishevskiĭ pyranom eters fixed to the top and bottom planes of an airplane, are described and commented. Tem perature, humidity and pressure of air were also recorded. It has been found that: 1) th density of the downward flow increases with the height, during which the vertical gradien decreases from .07 cal/cm²/min in the .5–1.0 km layer to .03 cal/cm²/min in the 2–5 km layer 2) the balance of solar radiation E↓ −E↑ increases in measure with the ascent over the earth surface with the gradient decreasing from .04 to .02 cal/cm²/min in the same layers; 3) th radiation warming up is of the .1°C per hour order, and decreases slightly with the heigh 4) albedo of the underlying surface and of the underlying layers increase by 2% in the averag during the ascent from .5 to 5.0 km height. *Subject Headings:* **1. Solar radiation absorptio data 2. Radiation climate of Odessa 3. Odessa, U.S.S.R.**

10.9–212 551.521.3:519.2:551.5

Krook, Max and Pecker, Jean Claude, **Sur le calcul de modèles d'atmosphère en équilibr radiatif (cas non-gris).** [The calculation of atmosphere models in radiative equilibrium (no grey case).] *Académie des Sciences, Paris, Comptes Rendus*, 247(16):1177–1179, Oct. 2 **1958.** 1 ref., 5 eqs. **DWB, DLC**—The obtaining of atmospheric models in radiative equili rium is a difficult problem. The criterion chosen by the different methods has always be the flow constancy. A 1% constancy was admitted as satisfactory. STRÖMGREN's meth is the most praised but it is very slowly convergent. The authors demonstrate that th method can be rendered more convergent and, consequently, that an excellent flow constan can be obtained. The slowness to convergence of STRÖMGREN's method is owed to the fa that the value F of the constant flow is nowhere introduced in the iterative process; the vali (F) of the computed flow varies from one stage of iteration to the following. When fasteni every successive approximation of the model to the value F, one reduces the relative importan of the terms of the equation of flow constancy on which bears the iteration. *Subject Heading* **1. Atmospheric models 2. Radiative equilibrium 3. Strömgren's method.**—*A.V.*

10.9–213 551.52

Krylov, P. A., **Iz rabot po solnechnoĭ postoiannoĭ.** [Work on the solar constant.] *Ak demiia Nauk SSSR, Izvestiia, Ser. Geofiz.* No. 10:1249–1261, Oct. **1957.** 4 figs., 3 tables, refs. **DLC**—The author gives a detailed account of the history of the measurement of t solar constant at the Smithsonian Institution, in particular the work of ABBOT, the apparat employed such as the water flow pyrheliometer of ABBOT and of SHULGU, the silver d pyrheliometer, the Ångström pyrheliometer. The procedures for determining the so constant, both the long and the short method, are described in detail and the various so constant values and their corrections are considered. *Subject Heading:* **1. Solar consta** —*I.L.D.*

10.9–214 551.52

Malkevich, M. S., **Teoreticheskiĭ raschet solnechnoĭ radiatsii pogloshchaemoĭ atmosfe za raznye promezhutki vremeni.** [Theoretical calculation of solar radiation absorbed by atmosphere at various time intervals.] *Akademiia Nauk SSSR. Geofizicheskiĭ Instĭ*

Trudy, No. 37(164):120–131, **1956.** 5 tables, 3 refs., 25 eqs. **DLC**—Formulas are derived for calculating the solar radiation absorbed at various altitudes by the atmosphere during any interval of time. It is shown that after the distribution of the absorption of solar radiation with height is averaged for 24 hrs, or for any other time interval, it deviates slightly from an exponential law. *Subject Heading:* **1. Atmospheric absorption.**—*Trans. of author's abstract (I.L.D.).*

10.9–215 523.77:551.521.326:551.594.5

†Krasovskiĭ, V. I. (*Inst. for Atmospheric Physics, Acad. of Sciences of the USSR, Moscow*), **The nature of emissions of the upper atmosphere.** *Annales de Géophysique*, Paris, 14(4):395–413, Oct./Dec. **1958.** 3 tables, 27 refs. **DLC**—Remarks related to the theory of the emissions of the night airglow, twilight flash and auroras. The author successively examines: hydroxyl bands, atomic hydrogen of the upper atmosphere, the [OI] 5577 Å emission, the [OI] 6300 Å emissions, the emission of NaI, the continuum, emission of O_2 and the auroral spectrum. The independence of the upper atmosphere emissions of solar activity in low and middle latitudes leads to a conclusion that solar ultraviolet radiation, responsible for these emissions, unlike the ionizing radiations, varies little, if at all, with solar activity. Owing to this circumstance, while searching for the true mechanisms responsible for the sky airglow, the author discards the excitation mechanisms connected to some other extent with ionization of the upper atmosphere. He did not find any processes which may be supposed to compensate for the action of the ionizing radiation variations during a cycle of solar activity. *Subject Headings:* **1. Upper atmosphere emission 2. Night airglow 3. Twilight flash 4. Auroras.**—*A.V.*

10.9–216 551.521.64:551.507.362.2

Aono, Yuichiro and Kawakami, Kinnosuke (*both, Radio Research Laboratories*), **Cosmic rays observed by satellite 1958 Alpha.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 12(1):28–36, **1958.** 7 figs., table, eq. **DWB, DLC**—Telemetering signals on 108.03 Mc transmitted from the satellite 1958 Alpha were received at Kokubunji and recorded on magnetic tape, which was analyzed by a sonagraph. Since the analysis gives the numbers of cosmic rays counted by a Geiger counter in the satellite, investigations were made on cosmic rays at high altitude. The analyzed results show a definite tendency for the number of cosmic rays to increase with altitude. It is quite remarkable that an extreme decrease of cosmic rays was observed at the beginning of the great magnetic storm on Feb. 11, 1958. Furthermore, some diurnal variation of the cosmic rays might be found in early evening at low altitude of a few hundred kilometers. *Subject Headings:* **1. Cosmic ray variations at high altitudes 2. Satellite cosmic ray measurement.**—*Authors' abstract.*

TEMPERATURE

See: **Temp. profiles, Greenland Ice Cap** (Pluvinage, Taylor), 10.9–52; **Temp. obs., N. Atlantic** (Houghton), 10.9–127; **Upper air temp. reduction** (Belen'kiĭ), 10.9–129; **Pressure-temp. relationships** (Chistiakov), 10.9–224.

SOIL TEMPERATURE

See also: **Temp. reduction, Basel** (Bider, Schüepp), 10.9–130; **Soil temp. instruments, Northeast Scotland** (Coutts), 10.9–147; **Frost damage to soil thermometers** (Gödecke), 10.9–149.

10.9–217 551.525:551.511

Orlenko, L. R., **O zavisimosti potoka tepla v pochvu ot temperatury poverknosti pochvy.** [The dependence of heat flow into the ground on the surface temperature of the soil.] *Meteorologiia i Gidrologiia*, Leningrad, 7:30–32, July **1957.** fig., 2 tables, 3 refs. **DWB, DLC**—The solution of the problem of the daily variation of temperature and its distribution in the atmospheric layer immediately above the ground as a limiting condition is made by the equation of heat balance at the level of the surface underlying the atmosphere. The solution is rendered difficult since the determination of one of the terms of the equation—heat flow in the soil—requires a knowledge of temperature distribution in the soil. In order to eliminate the $z<0$

(soil) in considering air temperature, the flow of heat in the soil is considered as a function of the temperature of the soil surface in the formula $B(t)=\alpha(T_0-T_{00})+\beta\frac{\alpha T_0}{\alpha t}$, where T_0 = temperature of the soil surface, T_{00} = soil temperature at any depth where diurnal temperature oscillations are absent, α and β = coefficients considered as constant over 24 hrs. This relationship was tested on the basis of a series of measurements at stations Golodnaya Step', Pakhta-Aral, etc. Coefficients α and β were determined for each series of observations by means of a graph of the dependence of heat flow in the soil (B) upon the temperature difference T_0-T_{00} over a 24 hour period. Coefficient α is equal to the tangent of its angle of inclination of a straight line through points in which $\partial T_0/\partial t=0$. Coefficient β is represented by the tangent of an angle of inclination of a straight line in coordinates $[\beta-\alpha(T_0-T_{00})]$ and $\alpha T_0/\alpha t$. Also α and β can be determined approximately from equations $\alpha=0.143\,cp\,\sqrt{k}-0.0012$ and $\beta=97.5\,cp\,\sqrt{k}-0.50$ where cp is total heat capacity and k is the coefficient of temperature conductivity of the soil. Computed values α, β, and cp, and values of B' and B computed by the above formula and by the formula of G. Kh. Tseitin are given. *Subject Headings:* **1. Heat balance of earth's surface 2. Soil surface temperatures 3. Heat flow into soil 4. Golodnaya Steppe, U.S.S.R.**—*I.L.D.*

10.9–218 551.525:551.579.5

Ranga, C., **Influenţa parameterilor termofizici ai solului asupra regimului său termic.** [Influence of thermophysical soil parameters upon the temperature regime.] *Meteorologia şi Hidrologia*, Bucharest, 1(2):3–13, Dec. **1956.** 4 figs., 11 refs., 11 eqs. **DWB**—The effects of various atmospheric and soil parameters upon the magnitude of night cooling are calculated, theoretically. It is found that the effect of soil moisture upon cooling of the soil surface is considerable (nomogram). With a soil moisture of 14%, the soil surface temperature may be 4° higher than in dry soil, other conditions being unchanged. In soil layers below 7 cm the effects of thermophysical soil characteristics are opposite to those at the surface. *Subject Heading:* **1. Soil temperature-soil moisture relationships.**—*G.T.*

10.9–219 551.525.2:551.511

†Miyakoda, K. (*Geophysical Inst., Tokyo*), **The individual change in surface air temperature and heat quantity supplied to the earth's surface.** *Meteorological Society of Japan, Tokyo, Journal*, Ser. 2, 35(5):257–265, Oct. **1957.** 9 figs., 14 refs., 3 eqs. **DWB, DLC**—Using the data of surface observation, amounts of temperature change during three hours due to the horizontal advection of air are calculated for every 3 hours during one month of May 1954 and they are compared with observed local changes in temperature. Further, the daily series of the individual changes in temperature are compared with those of the heat supplied to the earth's surface. Then, it is shown that in daytime they are well correlated with each other and that later in the night the correlation is low, though in early night it is comparatively high. These circumstances are discussed in this paper. *Subject Headings:* **1. Heat balance of atmosphere 2. Advection of heat.**—*Author's abstract.*

10.9–220 551.525

Chang, Jen-Hu (*Harvard Univ.*), **World patterns of monthly soil temperature distribution.** *Association of American Geographers, Annals*, 47(3):241–249, Sept. **1957.** 13 figs., table, 6 refs. **DWB**—Monthly temperature data of 780 stations throughout the world are summarized on maps, which show outlines of soil temperatures at depths of 10 cm, 30 cm and 120 cm for the months of Jan., April, July and Oct. Both the limitations of the records and method of treatment of the data and the construction of the maps are discussed. The standard deviations of Jan. and July air and soil temperatures from long record means at Seoul, Singapore and Dublin were computed. *Subject Headings:* **1. Soil temperature data 2. Soil temperature, world distribution.**—*I.L.D.*

10.9–221 551.525

Fu, Pao-p'o (*Dept. of Met., Nanking Univ.*), **On the computation of possible lowest ground temperature.** *Acta Meteorologica Sinica*. Peking, 29(2):63–72, May, **1958.** fig., 5 tables

5 refs., 23 eqs. In Chinese; English summary p. 72. **DWB**—First in this paper we have described the method of determination of the parameters in Shiehter's formulas when there is no direct observation. Then a method of computing possible maximum freezing depth and possible lowest ground temperature is given. With this method we have computed the maximum freezing depth and lowest ground temperature at Peking for the winter of 1954. It is found that the results of calculation are in good agreement with the observed values. *Subject Headings:* **1. Soil freezing depth computation 2. Peking, China.**—*Author's abstract.*

10.9–222 551.525.5:551.588.6

Pierce, R. S. (*Northeastern Forest Experiment Station, Laconia, N. H.*), **Effect of land use on the depth and duration of soil freezing in the Northeast.** *Eastern Snow Conference, 1956 and 1957, Proceedings*, Vol. 4:11–14, pub. **1957.** fig., 2 tables. **DWB** (M06 E14p)—The results of studies in 1950–1952 on soil freezing under varying cover conditions are reported. Observations were made on frost type and depth, snow depth and water content, and litter and humus depths; frozen soil horizons were recorded; and the data were analyzed to determine average and accumulated depths of concrete frost, its frequency, and average snow depth. Frost was deepest and most frequent under non-forest conditions, the differences being due to differences in organic content, compaction, cover, and snow depth. Forests had the least concrete freezing, hardwood stands having less frost than conifers. *Subject Headings:* **1. Soil freezing data 2. Forest influences on soil freezing.**—*SIPRE abstract.*

10.9–223 551.525.5

Shvetsov, P. F. and Meĭster, L. A., **Dozhdeval'no-infil'tratsionnyĭ sposob protaivaniia rossypeĭ, kak odin iz priemov gidrotermicheskoĭ melioratsii merzlykh gornykh porod.** [A sprinkling-infiltration method of thawing of alluvial deposits, as one of the techniques of hydrothermal amelioration of frozen rock.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geog.*, No. 6:79–84, **1956.** 2 figs., 10 refs. **DWB**—Various observations made in Russia during the 19th century of the more extensive and rapid thawing of sandy as compared with clayey soils when excess rainfall occurs are reviewed briefly. The sprinkling infiltration method of thawing consists in subjecting an open frozen ore deposit to sprinkling along the entire worked area. The sprinkling should be carried out within the boundaries of zones extended parallel to the horizontal, and in sequence from below, upwards along a slope from one drainage ditch to another. In this way short subsoil flow with large slopes of water-resistant channel and pressure gradients arise. It is assumed that, in a short flow and with frequent sprinkling, a maximum temperature gradient is established between the frozen deposit and the upward moving water so that the heat transfer is increased and thawing is intensified in the sprinkled area. This in time increases the slope surface of frozen sand-gravel deposit towards the drainer and hence increases the velocity of water movement in the pores of the layers so that heat exchange and thawing are intensified. The procedure for the detailed and efficient application of this method is described. *Subject Headings:* **1. Soil thawing 2. Sprinkling method of soil thawing 3. U.S.S.R.**—*I.L.D.*

WATER TEMPERATURE

See: **Sea surface temp.** (Cochrane), 10.9–81; **Marine obs. and temp. gradient** (Houghton), 10.9–127.

PRESSURE AND WIND

PRESSURE

See also: **Pressure reduction** (Harrison), 10.9–25; **Constant pressure analysis manuals,** 10.9–36; **Regression eqs.** (Belen'kiĭ), 10.9–129; **Gradient wind perturbations** (Sadokov, Dobryshman), 10.9–234.

10.9–224 551.547.5:551.524.7

Chistiakov, A. D., **Sredniĭ uroven' v atmosfere.** [Mean level in the atmosphere.] *Meteorologiia i Gidrologiia*, Leningrad, No. 3:36–38, March **1958.** 2 tables, ref., 4 eqs. **DWB**

—An equation is developed for computing the variations in height of any isobaric surface caused by temperature changes. This equation is

$$\left(\frac{\partial Hp}{\partial t}\right)_T = \left(a_{100}\frac{\partial T_{100}}{\partial t} + a_{850}\frac{\partial T_{850}}{\partial t} + a_{700}\frac{\partial T_{200}}{\partial t} + a_{150}\frac{\partial T_{150}}{\partial t} + a_{50}\frac{\partial T_{50}}{\partial t}\right).$$

Variations in heights of the principal isobaric surfaces determined by temperature changes were computed for 100 points by means of this formula. Also heights of mean levels, i.e., heights where $\left(\frac{\partial H}{\partial t}p\right)_T = 0$ were calculated. In 73% of the cases the changes of temperature in the troposphere and stratosphere were of opposite sign. In such cases of temperature changes, two mean levels—one in the troposphere and one in the stratosphere—were observed. The level of the latter is close to the mean isobaric surface of 150 mb (160 mb); the height of the former is between the 700 and 500 mb isobaric surfaces. When the temperature variations in the troposphere and stratosphere were of the same sign (11%) one mean level was observed. In 16% of the cases the temperature changes were more complex and three mean levels were observed in most of the cases, and at least one of them was in the stratosphere. Tables giving the values of coefficient a for various isobaric surfaces and local variations of the heights of isobaric surfaces caused by temperature changes from 0600 o'clock Nov. 11 to 0610 o'clock Nov. 25, 1956 are presented (for Oslo, Erlangen and Jan Mayen). *Subject Headings:* **1. Isobaric surface height variations 2. Pressure-temperature relationships 3. Upper air temperature-pressure relationships.**—*I.L.D.*

TURBULENCE AND HORIZONTAL DISTRIBUTION

See also: **Wind field above the ocean** (Tareev), 10.9–82; **Turbulence in clouds** (Braham et al.), 10.9–178.

10.9–225 551.551.2(441.1)

Bérenger, M. and Pages, B., **Contribution à l'étude des rafales, Brest-Guipavas, juillet 1946–juin 1956.** [Contribution to the study of gusts, Brest-Guipavas, July 1946–June 1956.] *France. Météorologie Nationale, Monographies*, No. 10, Oct. 1958. 31 p. 27 figs., 7 tables, ref. **DWB**—In this note the authors try to determine, through a statistical method, the force of gusts as regards the mean wind. Utilizing anemometric recordings covering a period of 10 yrs, made at the meteorological station of Brest-Guipavas, the frequency of gusts is at first determined for each value of mean wind. After this, and taking only into account the gusty-winds, the curves of mean speeds of gusts are established, together with those of maximum speeds (in the form of cumulated frequencies) for two periods of the year: Oct.–March and April–Sept. One considers first the total population, then the sub-populations corresponding to defined disturbed currents. A comparison is established between the different curves obtained in this manner. These results may be utilized in the forecasting of gusts. After some remarks on gusts, the authors conclude with a criticism of the study. *Subject Headings:* **1. Gust velocities 2. Gust forecasting.**—*A.V.*

WIND VARIATIONS

10.9–226 551.553.21:551.587

Gavrilova, Z. I., **O dal'nevostochnom mussone.** [Far East monsoon.] *Leningrad. Nauchno-Issledovatel'skiĭ Institut Aeroklimatologii, Trudy*, No. 3:57–69, 1957. 6 figs., 11 refs. **DWB**—The structure, variations and precipitation associated with the "Far Eastern Monsoon" are analyzed and discussed. Charts of airflow for each month from 1928–40 and 1947–50 were drawn to obtain statistics on the stability, the onset and ending of the monsoon, and the precipitation associated therewith. The transition from winter to summer occurred in May and from summer to winter in Sept. The summer monsoon extends on the average to 2 km, and the winter monsoon to 3 km altitude. *Subject Headings:* **1. Monsoons 2. Upper air climatology 3. Far East.**—*M.R.*

10.9–227 551.553.21:551.515.73

Lapeyre, P., **Cheminements de surface et isohypes dans la mousson d'hiver de l'Asie.** [Surface movements and isohypses in the Asiatic winter monsoon.] *La Météorologie*, Paris, Ser. 4, No. 44:407–409, Oct./Dec. **1956.** figs., 3 refs. **DWB**—The author describes briefly the mechanism of the winter monsoon in Asia and distinguishes two kinds of surface movements and isohypses, namely: (1) where there are considerable movements of surface anticyclones and cyclones and where these movements correspond to isohypses of entrainment levels by upper currents; and (2) where the anticyclones and cyclones are stationary or almost stationary between the characteristic regions of upper isobaric surfaces (peaks and crests, troughs and valleys). The mean surface isobars and mean isohypses of 500 mb have been traced, and the moving and stationary cyclones and anticyclones for Jan. 1947 are compared with the 500 mb isobaric surface. It is concluded that historical analogies between surface movements can be used in forecasting only if they correspond to air masses of comparable extent and thickness. It is necessary to study simultaneously the evolution of moving and stationary anticyclones and cyclones and the mean isohypses of different levels in order to make long range three dimensional forecasts of the general circulation. *Subject Headings:* **1. Winter monsoon 2. Anticyclone movement 3. Isohypses 4. Stationary anticyclones 5. General circulation forecasting 6. Asia.**—*I.L.D.*

WIND EFFECTS

See also: **Wave forecast.** (Rattray, Burt), 10.9–86.

10.9–228 551.556.8:551.461.2(749)

Miller, Arthur R. (*Woods Hole Oceanog. Inst.*), **The effect of steady winds on sea level at Atlantic City.** *Meteorological Monographs*, Boston, 2(10):24–31, June **1957.** 5 figs., 2 tables, 7 refs. **DWB, DLC**—From a study of tidal records for Atlantic City, N. J., and daily weather maps over a period of six months, the elevation of the sea surface associated with the geostrophic wind field has been evaluated as a function of the geostrophic wind velocity. The relationships are expressed in a nomogram. Assuming the angle of deviation between surface and geostrophic winds to be 20°, and allowing for the static effects of atmospheric pressure, maximum elevation above the predicted tide level is observed when the surface wind blows 40° from the right of normal to the coastline. In general, there appears to be a 12 hr lag between the winds and the associated state of sea level. *Subject Headings:* **1. Wind effects on water surfaces 2. Sea level variations 3. Atlantic City, N. J.**—*Author's abstract.*

10.9–229 551.465:551.556.8(64)

Simonet, R. and Tanguy, O., **Etude statistique de la houle dans les différents ports marocains.** [Statistical study of swell in different Moroccan harbors.] *Rabat, Morocco. Institut Scientifique Chérifien. Service de Physique du Globe et de Météorologie, Annales*, 17:73–83, **1957.** fig., 16 tables, 7 refs. **DLC**—The frequency tables included in this note indicate the frequencies of the swell amplitudes month by month, by seasons, and for two long periods, the one from May to Sept. and the other from Oct. to April. The frequencies are expressed in p.c. and are related to the different Moroccan harbors. The authors compare the amplitudes of the swells around the Azores with those of the Moroccan coast. The frequencies of the periods are the same within some p.c., around the Azores and at Casablanca. *Subject Headings:* **1. Swell 2. Morocco.**—*A.V.*

10.9–230 551.556.8:532.593(261.2)

Petri, O., **Statistik der Meereswellen in der Nordsee auf Grund von Beobachtungen der Bordwetterwarten des Deutschen Wetterdienstes.** [Statistics of sea waves in the North Sea on the basis of observations from weather ship stations of the German Weather Service.] *Hamburg. Seewetteramt Einzelveröffentlichungen*, No. 17, **1958.** 38 p. figs., tables. **DWB**—This attempt to treat swells and waves in the entire North Sea region in a statistical manner is valuable to ship construction, navigation and deep-sea fishing, although limited by more or less irregular and intermittent observations and vastness of area covered. The material on which this work is based are 2756 observations of wave heights and 2675 of wave periods during May 31, 1950–Dec. 9, 1956 and Feb. 15, 1955–Dec. 12, 1956. The topics treated here are:

(1) Wave sizes without consideration to wind relationships; (2) wave sizes dependent on winds; and (3) comparison with other wave observations. The detailed graphical and tabular presentations of the results are well organized. *Subject Headings:* **1. Sea wave height 2. Wind waves 3. North Sea.**—*W.N.*

10.9–231 551.556.8:532.593

Phillips, O. M. (*Dept. of Mech. Engineering, Johns Hopkins Univ.*), **The equilibrium range in the spectrum of wind-generated waves.** *Journal of Fluid Mechanics*, London, 4(4):426–434, Aug. **1958.** fig., 10 refs., 9 eqs. **DWB**—Analysis of wind-generated waves in the case of wind duration and fetch so large that the smaller scale components of the wave field come to a static equilibrium. This is based upon the idea of an equilibrium range in the wave spectrum. It shows that for large values of the frequency ω, the spectrum $\phi(\omega)$ is of the form $\phi(\omega) \sim \alpha g^2 \omega^{-5}$, where α is an absolute constant. An investigation of the validity of this spectrum formula shows that for large ω with $\alpha = 7.4 \times 10^{-3}$ any predictions of the equilibrium range will agree with measurements made in 1955 by BURLING. References are given to BURLING's work and those of others in the field. *Subject Headings:* **1. Wind waves 2. Wave generation.**—*N.N.*

10.9–232 551.556.81:532.593(262.8/9)

†Sirotov, K. M., **Razvitie i zatukhanie vetrovykh voln v Apsheronskom raĭone Kaspiiskogo moria.** [Development and decay of wind waves in the Apsheron region of the Caspian Sea.] *Moscow. Gosudarstvennyĭ Okeanograficheskiĭ Institut, Trudy*, No. 38:34–83, **1957.** 15 figs., 25 tables, 33 refs. **DWB, DLC**—This comprehensive investigation of the development and decay of waves with acceleration of the wind and the elaboration of a suitable method of calculating the height of waves is based upon experimental studies carried out at Neftianye Kamni in the Apsheron District. This study comprises the following: method of field experimental investigations of waves, including accuracy of observations on wave heights according to the Ivanov perspectometer, observations with a wave measuring rod, comparison of observations of wave heights with a perspectometer and a measuring rod with the observations made with a wave meter, comparison of the heights of three dimensional waves obtained by stereophotogrammetry with heights recorded by a wave meter, and the function of distribution of three dimensional waves, and the physical geographical conditions for the development of waves and the principal wave regime in the Neftianye Kamni district; geographical position of the Neftianye Kamni banks and maximum wave fetch, the characteristics of the wind regime in Neftianye Kamni, wind acceleration, bottom relief; principal characteristics of the wind regime, maximum wave elements, frequencies of different wave heights and duration of periods with different wave heights. The section on development and decay of winds is comprised of a discussion of the selection of observational material for analyzing wave development, nomograms for computing the height of waves in a strongly intensifying wind, the maximum height of waves during storms, calculation of the heights of waves from nomograms in the case of storms with a non-northerly direction, verification of the accuracy of computations of developing waves, arrangement of the observations for investigating the decay of waves, influence of initial height of waves and negative acceleration of wind upon wave decay, computation of the height of decaying waves and verification of computed wave decay by means of observations. The relevant empirical equations and nomograms and computed results, and observational data, are presented. *Subject Headings:* **1. Wind waves 2. Wave decay 3. Wave heights 4. Neftianye Kamni Region, Caspian Sea.**—*I.L.D.*

10.9–233 551.556.8:532.59(262.8/.9)

*Vilenskiĭ, Ia. G. and Glukhovskiĭ, B. Kh., **Eksperimental'noe issledovanie protsessa morskogo vetrovogo volneniia.** [Experimental study of the mechanism of ocean wind waves.] *Moscow. Gosudarstvennyĭ Okeanograficheskiĭ Institut, Trudy*, No. 36:9–62, **1957.** 28 figs., 8 tables, 4 refs. **DWB**—In order to investigate such problems as deformation of wave elements of open seas in shallow waters, the distribution of wave elements on the sea surface at varying depths, the relation between mean values of wave elements, and between peaks, troughs, etc., the authors carried out observations on wind and waves on the Caspian Sea in the Neftianye Kamni region. In their analysis they also used long period observations obtained in 1952 in the Baltic Sea by the State Oceanographic Institute. The observational methods used to

measure and record waves and winds are described and data on the most intense storms observed during the period 1953–1954 are presented with the aid of graphs, showing the variation of wind velocity, mean period, mean and maximum height of waves, and also the heights of waves at the 5% confidence level. The problems of the deformation of waves in shallow waters are studied with the aid of probability theory. A graph (in which the dimensionless coefficient $k_h = h_i/h_m$ [h_i = height of wave, i = the confidence] is the ordinate and h_m/H [where h_m = mean height of wave and H = depth of sea], a dimensionless parameter plotted on the abscissa) is constructed, permitting the qualitative and quantitative evaluation of both the deformation of wave heights of any confidence level and increase or decrease in depth of the sea. The distribution of the periods of waves in shallow waters is discussed with the aid of graphs showing the relative variation of the mean value of the period of waves as a function of the rate of mean wave length in deep water to the depth of a point for which the new value τ_{mH} is determined. On the ordinate axis is the dimensionless magnitude τ_H/τ_α (τ_H = period at depth H, τ_α = period in deep water) and on the abscissa is the parameter $L_{m\alpha}/H$ (where $L_{m\alpha}$ = mean length of wave in deep water). Also the relationships between the heights of ridges and troughs of waves are analyzed as functions of their distribution. Finally, the relationships between mean values of heights of wave periods for various wind velocities, between mean heights and periods of waves for various depths, between heights and periods of propagation of waves for different wind velocities and depths are examined. Extensive data on wave heights, wave periods, relative wave heights (relative to h_m), relative periods, percent confidence level, and the basic data of the five storms are presented in appendices. *Subject Headings:* **1. Wind waves 2. Sea waves 3. Wave heights 4. Shallow water waves 5. Neftianye Kamni Region, Caspian Sea.**—*I.L.D.*

UPPER AIR WINDS

See also: **Vertical diffusion rates** (Hilst, Simpson), 10.9–126; **500 mb jet stream, N. Hemisphere** (Bayer), 10.9–134; **Wind, ceiling and visibility data, Burma,** 10.9–139; **Wind velocities, Fla., New Mex.,** 10.9–142; **Horizontal divergence comp.** (Bates), 10.9–184.

10.9–234 551.557:551.542.1

Sadokov, V. P. and Dobryshman, E. M., **O reshenii uravneniia, opisyvaiushchego vozmushcheniia v pole gradientnogo vetra.** [Solution of equations describing the perturbations in a gradient wind field.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy,* No. 43(70):34–48, **1956.** 4 refs., 23 eqs. **DWB, DLC**—In the problem of the adaptation of wind in the atmosphere, I. A. KIBEL' developed an equation for the potential part of the movement φ which may be written in the formula

$$L^2\left(\frac{\partial^2\phi}{\partial y^2} - \frac{\partial^2\phi}{\partial y^2}\right) + \frac{1}{l^2}\frac{\partial}{\partial P}P^2\frac{\partial}{\partial P}\left(\frac{\partial^2\phi}{\partial t^2} + l^2\phi\right) = 0$$

where t = time, x, y = horizontal coordinates, P = pressure acting as a vertical coordinate, L = parameter having dimensions of length and determining the scale along the horizontal, $l = 2w \sin\theta$-Coriolis parameter, θ = geographic latitude. This equation can be solved for the following initial and limiting conditions:

$$t = 0, \quad \phi = \phi_1(x, y, P); \quad \frac{\partial\phi}{\partial t} = \varphi_2(s, y, P),$$

$$P = 0, \quad P^2\frac{\partial\phi}{\partial P} - \text{finite},$$

$$P = P_0\frac{\epsilon}{l^2}\frac{\partial^2\phi}{\partial t^2} + \phi = 0.$$

$x^2 + y^2 \to \alpha$; φ = bounded; ϵ = may equal 1 or 0. A formal solution of this problem is presented. *Subject Heading:* **1. Gradient wind perturbations.**—*I.L.D.*

10.9–235 551.557.2:551.511.32

§Doumont, G., **L'advection des isohypses relatives, appliquée à une couche isobarique particulière: 850–500 mb. 2me partie.** [Advection of relative isohypses as applied to the

particular isobaric level 850–500 mb, Pt. 2.] *Belgium. Régie des Voies aériennes, Service Météorologique, Bulletin Trimestriel,* March/May, **1958.** p. 1–6. 21 figs. (including charts), 2 tables, 12 eqs. French, English, German and Dutch summaries. **DWB**—In the first part, a qualitative study had been made of the approximation which consists of replacing the wind hodograph by the straight line bearing the relative wind vector of the layer. In order to provide a quantitative review of the question, a series of planimeter measurements is presented; it shows that considered approximation leads to unacceptable errors. Further, the numerical form of the linear regression of $T-T_m$ upon I_s is given, as well as a few comments concerning the regression sounding to be used as a substitute to the actual one. An investigation of the corrective advection term arising from the v_β term reveals that its value is negligible for practical purposes. This fact allows for a quick calculation of the total advective thickness tendency, and a comparison with the complete hodograph tendency provides information as to the synoptic importance of the ageostrophic tendency. Finally, the advecting current v_m is treated according to the Fjørtoft method in view of a 24-hour period advection of thickness lines, and an opinion is expressed as to the value of results obtained in the experiment. (For Pt. 1, *see* 9.7–159, July **1958,** *MAB.*) *Subject Headings:* **1. Advection of relative isohypses 2. Ageostrophic tendency 3. Upper air temperatures 4. Stability index.**—*Author's abstract.*

10.9–236 551.557.2

Holzapfel, Rupert, **Über die Luftbewegung bis 30 Km Höhe über Berlin.** [On air motions to 30 km height over Berlin.] *Meteorologische Rundschau,* 11(1):34–36, Jan./Feb. **1958.** fig., table, 4 refs. **DWB, DLC**—During the period 1948–1956 some 10,000 electrical measurements of upper altitude winds over Berlin were made. Of these 1660 or 16% attained a height of 22 km and 722 or 7% a height of 28 km. A climatological analysis of these wind data is presented. It is shown that the wind over Berlin increases with altitude to the null-layer (about 10 km), diminishes up to about 18 km and then increases again at least up to 30 km aloft. Up to a height of 18 km the form of the wind roses is determined by a prevailing west drift throughout the year. During winter and the transition periods the west drift extends to at least 30 km aloft. During summer, from the middle of May to the middle of August this west drift reverses itself above 18 km so that the form of the wind roses between 20 and 30 km aloft is determined by an east drift. The data is presented in a table and a graph. *Subject Headings:* **1. Upper air wind roses 2. Berlin, Germany.**—*Author's abstract and I.L.D.*

10.9–237 551.557.5

Barbé, G., **Sur l'étude expérimentale des courants jets atmosphériques.** [On the experimental study of the atmospheric jet streams.] *Académie des Sciences, Paris, Comptes Rendus,* 247(2):230–233, July 16, **1958.** 3 refs., 3 figs. **DLC**—Twenty-three successive soundings made in 24 h, on Jan. 6 and 7, 1958, show certain elements of the fine transversal structure of a jet stream with great velocity. The maximum wind speed, near 360 km/hr, has been measured at a height of 8600 m. The vertical maximum wind gradient of 90 km/hr for 1 km has been observed below the axis between altitudes of 4 and 6 km and above the axis between altitudes of 11.5 and 12.5 km. The maximum horizontal wind gradient, on the cold side of the tube: 225 km/hr for 100 km between two points situated, respectively, at 50 and 90 km from the tube axis; on the warm side: 17 km/hr for 100 km, between two points situated, respectively, at 200 to 500 km of the tube axis. The tube, on whose surface a speed of 300 km/hr, or 5/6 of the wind maximum is observed, has a width of 400 km. *Subject Heading:* **1. Jet stream structure.**—*A. V.*

10.9–238 551.557.5:629.13–656.7

Les "Jet-Streams" facilitent la navigation aux grandes altitudes. [Jet streams facilitate navigation at high altitudes.] *La Nature,* Paris, No. 3285:35, Jan. **1959. DLC**—Some general information relating to the jet stream; the most interesting form of which, as concerns aviation, is the one extending over the North Atlantic route. Utilizing jet streams has already made for important gains on the North Atlantic crossing. Much remains to be done concerning research and observation of wind as well as in the field of direct application of winds. *Subject Headings:* **1. Jet stream navigation 2. High altitude navigation.**—*A. V.*

10.9–239 551.557.5:551.513.1:608.4

Sheppard, P. A.; Scorer, R. S.; Sawyer, J. S. and Gordon, A. H., (**Discussion of**) **Herbert Riehl and Dave Fultz: Jet stream and long waves in a steady rotating-dishpan experiment-structure of circulation (and) Reply by Riehl and Fultz.** *Royal Meteorological Society, Quarterly Journal*, 84(360):186–187, April, 1958. **DWB, DLC**—Sheppard insists that for an understanding of the general circulation one must consider the momentum balance as well as the radiation input. Fultz replies that such is indeed the case, but that one must be careful about the conclusions one draws from the models where an easterly rather than a westerly flow in mid-latitudes would seem to upset the eddy structure, when, in fact, it might not make any essential difference. Scorer objects to models which may be inverted without great effect on behavior, whereas "the atmosphere cares which way up it is," and there are no vertical surfaces promoting heat sources and sinks as there are in some models. Fultz replies that the models have friction at the bottom which spoils the symmetry and the atmosphere has more symmetry than might be supposed. Sawyer wonders if the jet is connected with bottom friction, Fultz thinks not, Gordon questions reality of Coriolis force in dishpan. (For abstract on original, *see* 8.8–259, Aug. 1957, *MAB.*) *Subject Headings:* **1. Rotating dishpan models 2. Jet stream models.**—*M.R.*

VERTICAL MOTION

See: **Convective currents** (Baev), 10.9–187; **Cyclonic vortexes, Texas, Apr. 1955** (Deardorff), 10.9–200.

AQUEOUS VAPOR, HYDROMETEORS AND HYDROMETEOROLOGY

HUMIDITY

See also: **Psychrometric slide rules** (Greinacher), 10.9–132; **Moisture transport** (Bogdanova), 10.9–189.

10.9–240 551.571.1

Drozdov, O. A., **Vozmozhen li areal zavershennogo vlagooborota.** [Is it possible to have an area with a closed system of moisture balance?] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 62(124):62–66, **1956.** 5 figs., 5 tables, 3 refs. **DLC**—A highly theoretical paper showing the impossibility of having an Atlantic area with a closed system of moisture balance, because such an area exists only for the earth as a whole, and an approximation to it in a limited area could only take place under condition of uniformity of winds carrying the water vapor towards very high mountains where a greater part of the vapor condenses. The author adds that such conditions may, possibly, occur in the Amazon River Valley, or in the Himalayas during the monsoon season. *Subject Headings:* **1. Moisture balance theories 2. Cloud moisture balance zones 3. Atlantic Ocean.**—*A.M.P.*

10.9–241 551.571.1:551.464

*Miyake, Yasuo (*Meteorological Research Inst., Tokyo*), **A table of the saturated vapour pressure of sea water.** *Oceanographical Magazine*, Tokyo, 4(3):95–118, Dec. **1952.** Almost entirely tables. **MH-BH**—A table is presented, containing saturation vapor pressure values for sea water at temperatures from −2° to 40°C (at 1/10 degree intervals) and chlorinities from 1‰ to 2‰ (at 1‰ intervals). *Subject Heading:* **1. Saturation vapor pressure of sea water.**—*G.T.*

EVAPORATION AND EVAPOTRANSPIRATION

See also: **Bibliography on Evapotranspiration, p. 1394.**

10.9–242 551.573:551.578.11

Miesse, C. C. (*Armour Res. Found. of Ill. Inst. of Tech., Chicago*), **Effect of a variable evaporation rate on the ballistics of droplets.** *Franklin Institute, Philadelphia, Journal,*

264(5):391–401, Nov. **1957.** 6 figs., 8 refs., 28 eqs. **DLC**—In order to allow for the effect of the variation of evaporation rate of a liquid droplet with its Reynolds number on its velocity and diameter variations, the present analysis considers the ballistics and evaporation (Frossling's) equations simultaneously. The resultant nonlinear equation yields analytical solutions for discrete value of the viscosity to still air evaporation rate parameter, which permit ready determination of the variation of drop size and relative velocity with time or distance. The results indicate that the constant evaporation rate analysis is valid for large values of the parameter mentioned above, but should be modified for smaller values. Numerous illustrative curves are presented, and the analysis is applied to available experimental data. *Subject Headings:* **1. Evaporation rate of droplets 2. Drop size 3. Drop velocities.**—*Author's abstract.*

10.9–243 551.577:551.578.11

Panchev, St., **Ob isparenii svobodno padaiushchikh krupnykh vodianykh kapel' v atmosfere.** [Evaporation of large drops of water during their free fall in the atmosphere.] *Bulgarska Akademiia na Naukite, Sofia, Doklady,* 10(5):355–358, Sept./Oct. **1957.** 3 refs., 11 eqs. French summary p. 358. **DWB**—It is shown theoretically that the velocity of large water drops falling freely through the atmosphere and decreasing by evaporation can be expressed by the same formula as that of water drops with constant mass. The author also establishes relationships between cloud height and the size distribution of rain drops reaching the ground. A numerical example is given. *Subject Heading:* **1. Evaporation of raindrops.**—*Transl. of author's abstract.*

CONDENSATION

See also: **Cloud physics and seeding** (WMO), 10.9–23; **Cloud Physics Symp., Toronto, 1957** (Dessens), 10.9–67; **Condensation Nuclei Symp.,** 10.9–72; **Ice and frost control bibliogs.** (McConica), 10.9–75; **Icing of aircraft studies** (Thompson), 10.9–110; **Cloud physics research** (McDonald), 10.9–140.

10.9–244 551.574.11:546.57:546.15

Halsey, George D., Jr.; Karasz, Frank E.; Pierotti, Robert A. et al., **The structure of adsorbed multilayers.** Washington (State) Univ. Dept. of Chemistry, Contract AF 19(604)-247, Final Report (**1955?**). 70 p. figs., tables, foot-refs., eqs.—This document contains several reports of research conducted at the Univ. of Washington, Seattle, on the following: the adsorption of argon in xenon layers, the solution of argon in layers of krypton, the growth of crystalline layers on foreign surfaces, a new multilayer isotherm with reference to entropy, the interaction of rare gas atoms with surfaces, the interaction of gas molecules with capillary and crystal lattice surfaces, the interaction of pairs of gas atoms with surfaces, heats of adsorption in pre-adsorbed xenon layers, regular solution theory applied to other systems, and the research on the adsorption of pre-adsorbed layers of polar molecules. The last section describes the preliminary results of the method developed to the growth of layers of ice on anatase and silver iodide. The result is that silver iodide appears to be completely incompatible with the ice structure at low temperatures. The meteorological interpretation of this result is not included in this report. *Subject Headings:* **1. Silver iodide effectiveness 2. Adsorption of multilayers. I. Prenzlow, Carl F.**—*N.N.*

10.9–245 551.574.12

Pshenaĭ-Severin, S. V., **O vliianii gidrodinamicheskogo vzaimodeĭstviia malykh oblachnykh kapel' na skorost' ikh padeniia.** [Influence of hydrodynamic interaction of small cloud droplets upon their speed of fall.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.,* No. 8:1045–1051, Aug. **1957.** fig., 3 tables, 19 refs., 10 eqs. **DLC**—The effect of the hydrodynamic interaction of cloud droplets on speed of their approach to one another or upon the speed of coagulation is analyzed with the aid of the formulas of Smoluchowski, Oseen and Faxen. It is shown that in the case of the Oseen regime of falling droplets (radius $R>20\mu$) the hydrodynamic interaction can bring about the coalescence of similar drops and increase considerably the speed of coalescence of drops of equal dimensions. *Subject Headings:* **1. Cloud droplets 2. Drop coagulation**—*Author's abstract and I.L.D.*

10.9–246 551.574.12

Sheppard, P. A. et al, **(Discussion of) B. J. Mason and D. K. Ghosh: The formation of large droplets in small cumulus (and) Reply by Mason.** *Royal Meteorological Society, Quarterly Journal*, 84(360):193–194, April **1958. DWB, DLC**—Discussion by A. W. Brewer, E. Gold, R. C. Sutcliffe, L. C. W. Bonacina and reply wherein B. J. Mason states that there is very little evidence of a natural deficiency of nuclei for initiating showers by coalescence, although there are times, such as after a long spell of extensive rain or where there is a long continental trajectory, when very low nuclei concentrations exist. Maritime air masses are full of salt nuclei of $m > 10^{-10}$ g, and these may appear 100 km inland without much change. Larger dust particles may, if wettable, work as well as hygroscopic nuclei. Formula for rate of washing out by rain gives order of magnitude of 90% reduction in 1–3 hours by rain of 5 or 1 mm/hr, respectively. (For abstract on original, *see* 9.2–226, Feb. 1958, *MAB.*) *Subject Headings:* **1. Droplet formation 2. Giant nuclei.**—*M.R.*

10.9–247 551.574.12 551.578.11

Shishkin, N. S., **Vliianie vida raspredeleniia oblachnykh kapel' po razmeram na velichinu kapel' dozhiia.** [Influence of cloud droplet size distribution on the size of raindrops.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 54(116):78–80, **1955.** 2 figs., 3 refs., 9 eqs. **DLC**—The formula of A. Kh. Khrgian and I. P. Mazin for determining the distribution of cloud droplets according to size, namely: $n(r) = ar^2e^{-br}$ where

$$a = \frac{\left(\frac{5}{2}\right)^6 q_w}{\pi p r^6 m} \quad b = \frac{5}{r_m},$$

q_w = water content of cloud, p = density of water and r_m = radius of droplets, is used to compute the growth of droplets in a cloud at the expense of the condensation of water vapor and the coagulation of the drops. The author develops the particular formulas for computing the condensational growth and coagulation and growth of drops, and for the growth of drops with height with a given initial current. Graphs showing the growth of the radius of rain drops on clouds and the size distribution of drops ($2_m = 8\mu$) are presented. *Subject Headings:* **1. Cloud droplet size distribution 2. Raindrop sizes 3. Raindrop coalescence.**—*I.L.D.*

10.9–248 551.574.11:551.578.11

†Komabayasi, M. (*Geophysical Inst., Tokyo Univ.*), **Salinity of individual raindrops and other quantities concerning rainfall (Some aspects of rain formation in warm cloud, Pt. 1).** *Meteorological Society of Japan, Tokyo, Journal*, Ser. 2, 35(4):205–220, Aug. **1957.** 9 figs., table, 28 refs., 18 eqs. **DWB, DLC**—Calculations of droplet growth are made based on a cloud model, through the cloud base in which upward currents do not enter. If raindrops form on large sea-salt particles in this cloud, it can be shown that the larger raindrops form on the larger sea-salt particles. Using this cloud model, functional relations are presented between the size distribution of large sea-salt particles and various quantities concerning the rainfall from a warm cloud. The rainfall intensity, the flux density distribution of raindrops with respect to radius, the salinity of rain water in bulk, and the salinity of individual raindrops are deduced. The function expressing the salinity of raindrops is found to have a minimum at a certain radius. This may be considered to show one of the tentative explanations for the appearance of minimum value of raindrop salinity found by Turner (1955) in the case of warm rains. Derived raindrop spectrum changes with rainfall intensity in a manner for some aspects resembling that found by Blanchard (1953) in Hawaii. The present calculations seem to be useful to some extent for quantitative estimations on some features of rainfall from orographic warm clouds. *Subject Headings:* **1. Saline nuclei 2. Salt content of precipitation 3. Rain from nonfreezing clouds.**—*Author's abstract.*

10.9–249 551.574.14:551.578.41

Kobayashi, T. (*Inst. of Low Temp. Science, Hokkaido Univ., Sapporo, Japan*), **Experimental researches on the snow crystal habit and growth by means of a diffusion cloud chamber.** *Meteorological Society of Japan, Tokyo, 75th Anniversary Vol. of the Journal*, publ Nov. **1957.**

p. 38–47. 5 figs., 14 photos, table, 14 refs. **DWB, DLC.** Also his: **Experimental researches . . . (Preliminary report).** *Low Temperature Science, Ser. A*, Sapporo, Japan, No. 15:1–12, **1956.** In Japanese; English summary p. 10–11. Also his: **Experimental researches . . . Pt. 2, Diffusion cloud chamber.** *Ibid.*, No. 16:1–26, **1957.** 31 photos, 21 figs., 2 tables, 17 refs. In Japanese; English summary p. 26. **DWB, DLC**—With the object of examining whether or not MARSHALL and LANGLEBEN's theory on the snow-crystal habit is in agreement with experimental fact, we carried out a series of experiments on artificial snow crystals by means of a diffusion cloud chamber where the cloud droplets had been previously removed. The ambient vapor density was measured by a "drop hydrometer" method. It was found (1) that the snow-crystal habit is primarily determined not by the excess of the ambient vapor density but by the ambient temperature; (2) that snow crystals produced in the aerosol-free air show tendencies to grow either in sheath form or in dendritic form with sector-like structure; and (3) that the trace of foreign vapors, e.g., silicone or acetone, remarkably affects the snow-crystal habit. The earlier, more complete reports cited above give details with numerous graphs and photographs showing apparatus, physical conditions, frequencies, growth habits under varying conditions, etc. (For detailed abstracts on the 2 Japanese articles cited above, *see* SIPRE Abstracts, No. 15677 (Vol. XII) and No. 16274 (Vol. XIII). *Subject Headings:* **1. Snow crystals 2. Snow crystal formation.**—*Author's abstract, M.R.*

10.9–250 551.574.14:536.421:546.212

Skapski, Adam (*Prof. of Physics, Univ. of Vermont*), **Melting points of small ice crystals and a capillary theory of maximum undercooling of water.** *Eastern Snow Conference, 1956 and 1957, Proceedings*, Vol. 4:52–53, pub. **1957.** 2 refs., 4 eqs. **DWB** (M06 E14p)—The maximum supercooling of water at which the solid and liquid phases will coexist in equilibrium is analyzed mathematically for the case of a small, spherical ice crystal in contact with water, using the next-neighbors theory of capillarity developed earlier for metals. The m.p. depression of the crystal is found to be directly proportional to its radius and to increase with decreasing radius as long as the interface tension between the solid and liquid retains its macroscopic value. The critical radius below which the interface tension ceases to depress the m.p. of the crystal is found to be 1.12×10^{-7} cm. and the maximum possible depression of its m.p. (and thus the maximum supercooling of water in equilibrium with the crystal) is 43°C, agreeing well with values found experimentally for water. *Subject Headings:* **1. Ice crystal melting 2. Supercooled water.**—*SIPRE abstract.*

10.9–251 551.574.42(427.4)

Bayliss, J. M., **Rime accretion.** *Meteorological Magazine*, London, 87(1029):90, March **1958. DWB**—The photograph that accompanies this report was taken on a Soft Graduation Panchromatic plate, exposed for 2 sec with lens aperture F.11 at 1000 G.M.T. on Dec. 22, 1956, at Bedale, North Riding of Yorkshire. The rime was observed coated with industrial smoke mixed with fog. This accretion was firm and hard probably due to freezing fog and persisted for 4 days with visibility in the range 30–100 yds and the air temperature between 27 and 33°F. The surface wind velocity varied from calm to 10 kn from between 090 and 170°. *Subject Headings:* **1. Rime accretion 2. Bedale, Yorkshire, Eng.**—*N.N.*

10.9–252 551.574.42(498)

§Chiriac, V., **Considerații în legătură cu chiciura moale ce se depune pe timp ceţos.** [Deposition of rime during foggy weather.] *Meteorologia şi Hidrologia*, Bucharest, 1(2):62–67, Dec. **1956.** 2 figs., 3 tables, 7 refs. **DWB**—General atmospheric conditions favoring rime formation are discussed and synoptic development from Jan. 27 to Feb. 5, 1955 (a period of considerable rime deposition in Romania) is described. A synoptic chart, temperature, humidity, pressure and wind data, and an aerological diagram are included. *Subject Headings:* **1. Rime formation 2. Synoptic conditions for rime 3. Romania.**—*G.T.*

FOG

See: **Smog, Los Angeles, Cal.** (Faith), 10.9–165; **Fog transmission** (Arnulf, Bricard), 10.9–208.

CLOUDS

See also: **Convective clouds** (Scorer), 10.9–28; **Cloud modification** (McDonald), 10.9–140; **Convective cloud electrification, European U.S.S.R.** (Imianitov et al), 10.9–162; **Refractive index in clouds** (Braham et al.), 10.9–178.

10.9–253 551.576.36:551.577.32(773)

*Changnon, S. A., Jr. and Huff, F. A., **Cloud distribution and correlation with precipitation n Illinois.** *Illinois State Water Survey Div., Report of Investigation*, No. 33, **1957.** 83 p. 23 figs., 18 tables, 4 refs. **DLC**—Study was prepared from punched cards of 442,000 hourly observations for 7 U. S. W. B. stations and 1 U. S. A. F. station in or bordering on Illinois, for 1949–1955. Charts show frequencies of cloud types. Corresponding data are given in tables. Monthly and seasonal variations in cloud type frequencies; diurnal patterns for various types; annual and monthly variations in cloud and amounts (tenths); relation between monthly cloud amounts and frequencies; seasonal correlation between cloud and precipitation amounts, cloud and precipitation frequency and between corresponding cumulonimbus and precipitation and dry period cloudiness (5 days or more). In the warm season there is a good correlation between cumulonimbus amount and also other low clouds and precipitation. *Subject Headings:* **1. Cloud-precipitation correlations 2. Cloud frequencies 3. Illinois.**—*M.R.*

10.9–254 551.576.36(791)

*Des Jardins, Robert B., **The distribution of clouds at Tucson, Arizona with respect to type, amount, and time of observation.** Institute of Atmospheric Physics, Arizona Univ., Contract NSF G-1101, Scientific Report No. 6, Jan. 1, **1958.** 52 p. 18 figs., 14 tables. **DWB**—Cloud data for Tucson, Ariz. for July 1945–1954 are analyzed statistically in every conceivable manner and presented, with ample discussion, in tables and graphs. The discrepancies in the data are mentioned and their causes (changes in cloud reporting procedure, climatic variations, etc.) are analyzed with suggestions for homogenizing the data presented for low, middle and high clouds, respectively. The diurnal, annual and year to year variations of clouds at Tucson are also treated in detail, both as to the frequency of convective and stratocumulus clouds, and middle and high clouds. Lastly the relation between cloud amount and precipitation is discussed and illustrated with graphs. *Subject Headings:* **1. Cloud frequency data analysis 2. Tucson, Ariz.**—*M.R.*

10.9–255 551.576.4(47)

Baranov, A. M., **Vertikal'naia protiazhennost' oblakov verkhnego iarusa nad Evropeiskoĭ territorieĭ SSR.** [Vertical extent of upper clouds over European U.S.S.R.] *Meteorologiia i Gidrologiia*, Leningrad, No. 6:22–25, June **1958.** fig., 3 tables, 7 refs. **DWB, DLC.** Trans. into English by R. S. Quiroz available. **DWB**—Observations on upper layer clouds made from airplanes during 1953–1956 over European U.S.S.R. included 736 reports of which 135 were made in winter, 224 in spring, 179 in summer and 198 in the fall. The heights of the upper margins of the clouds varied in every season from 6–7 to 12–14 km. In winter, spring and fall the maximum frequency extends from 8.1 to 9.0 km; in the summer from 9.1 to 10.0 km. This regularity in the frequency variation of the heights of Ci and Cs clouds indicates a definite relationship to the troposphere. The lower margin of the clouds shows considerable variation. At a height of about 6 km this margin is observed in winter in 43.6% and in summer in 24.6% of the ascents, while above 8 km it is observed in winter in 6.7%, in summer in 12.3%, and in spring and fall in 11.2% and 9.2% of the ascents, respectively. The mean height of the upper and lower margins of these Ci and Cs clouds is characterized by a distinct seasonal variation. The vertical extension of Ci and Cs clouds varies slightly from season to season, being on the average 2 km. Most of these clouds have a thickness of 1.1 to 3.0 km (45 to 47%). In rare instances it may attain 4–5 km and even 6–7 km; a thickness of 0.5 km and less is observed in only 13–19% of the cases. The relationship between the thickness of Ci and Cs clouds and synoptic conditions is discussed. *Subject Headings:* **1. Upper level cloud observations 2. Cloud height data 3. European U. S. S. R.**—*I.L.D.*

10.9–256 551.576.4:551.501.776

Chestnaia, I. I., **O kolebanii vysoty nizhneĭ granitsy sloistykh oblakov.** [Height variations of the base of stratiform clouds.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia,*

Trudy, No. 54(116):24–30, **1955.** 4 figs., ref. **DLC**—The problem of determining accurately the height and structure of the lower boundary of stratiform clouds is discussed and a method for studying these properties with the aid of airplanes is described. The results of 56 flights for which visual observations and meteorograms were available are divided into four groups: (1) height of the cloud base was constant or changed slightly; (2) height of the base varied with extent; (3) height varied with time; and (4) height of the base varied with both extent and time. The synoptic situations associated with each cloud group, the cloud types within each group and the extent of variations in the height of the base of the clouds with extension and time are discussed and the data as presented are in graphs. No relationship was found between variations in height of the base and the underlying surface. The magnitude of the variations in height corresponds to those found by ZAK and MARFENKO (*Trudy TSAO*, No. 7, 1952). No periodic oscillations were observed. *Subject Headings:* **1. Cloud height measurement techniques 2. Cloud base height variations 3. Airplane observation of cloud height.**—*I.L.D.*

10.9–257 551.576.4:551.576.11(59)

*Littlejohns, L. W., **High cloud structure in equatorial Southeast Asia.** *Meteorological Magazine*, London, 87(1032):172–179, June **1958.** fig., 11 tables, 6 refs. **DWB, DLC**—Purpose of this study is to compile statistical summaries of incidence and altitude of high clouds in equatorial southeast Asia where surface and upper air observations are sparse. The material analyzed was verbal pilots' reports as recorded at Changi, Butterworth and at Negombo after flights above 25,000 ft during Feb. 1954–Aug. 1956. The tabulated results include: (1) percentage frequency of high clouds, (2) frequency of tops of cumulus and cumulonimbus, (3) frequency of medium cloud, (4) frequency of types of high clouds, (5) frequency of heights of bases of Ci and Cs, (6) frequency of heights of tops of Ci and Cs, (7) number of Ci and Cs bases or tops not reported, (8) frequency of unreported Ci and Cs bases or tops at various levels for all months, (9) frequency of thickness of high clouds (all months), (10) frequency of turbulence and (11) frequency of contrails. *Subject Headings:* **1. Cloud height data 2. Cloud structure 3. Tropical clouds 4. Southeast Asia.**—*W.N.*

PRECIPITATION

See also: **Floods, Great Plains, 1957** (Kutschenreuter), 10.9–21; **Rain gage construction, Hochserfaus, Austria** (Paulczinsky, Tollner), 10.9–128; **Numerical rainfall forecast., U. S.,** 10.9–156; **General cir. studies and synoptic climat.** (Dzerdzeevskiĭ), 10.9–193; **Cloud precip. correlations, Illinois** (Changnon, Huff), 10.9–253.

10.9–258 551.577.31(439.1

*Milosavljević, Katarina, **Prilog poznavanje strukture kišnih dana.** [Contribution to the study of the structure of days of rain.] Belgrade, Gradevinska Knjiga, **1957.** 45 p. 8 figs, 18 tables, 12 refs. **DWB** (M77.3 M661pr)—Interdiurnal variability of rainfall at Belgrad (1925–1956), Vansačka Banja (1929–1941) and Prilep (1926–1939) is analyzed in tabular and graphical form. The values of interdiurnal variability are given for each month (April-Nov.) covering the following parameters: rainfall amount, absolute maxima, rainfall duration, frequency and intensity. The identification of each station's climatic type on the basis of its interdiurnal and monthly rainfall regime is discussed. *Subject Headings:* **1. Rainfall variation 2. Interdiurnal rainfall variations 3. Hungary.**—*G.T.*

10.9–259 551.577.3(427.2

Reynolds, G. (*North of Scotland Hydro-Electric Board*), **Abrupt changes in rainfall regime Pt. 2.** *Weather*, London, 13(5):151–153, May **1958.** fig., table, 3 refs. **DWB**—In order to confirm statistically an earlier statement that annual rainfall at Bidston for the period 1867–1955 could be divided into 5 regimes with different means and standard deviation and to overcome various objection to the statistical procedures employed, the author obtained a mathematically random series "by drawing from a hat in turn slips of paper each inscribed with one year's Bidston rainfall total." The resulting cumulative residual curve showed 5 rainfall "regimes." Student's "t" test gave a significant difference between "regimes" 4 and 5 at the 1% level and between 4 and 5 at the 5% level and Snedecor's variance ratio test gave a signi

cant difference between the variances of 4 and 5 at the 1% level. It is pointed out that slight skewness can produce singularly incorrect results with the standard statistical significance tests. (For Pt. 1, *see* 7.11–253, Nov. 1956, *MAB.*) *Subject Headings:* **1. Rainfall regime 2. Annual rainfall variations 3. Bidston, Liverpool, Eng.**—*I.L.D.*

10.9–260 551.577.35:551.577.38(436)

Steinhäusser, H., **Niederschlags- und Trockenperioden und ihre theoretische Behandlung (Kurzreferat).** [Precipitation periods and drought periods and their theoretical treatment (summary).] *Annalen der Meteorologie*, Hamburg, 8(3/4):97, **1957. DWB, DLC**—A non-quantitative and largely descriptive brief account of statistical procedures employed to study the length and frequency of drought periods at three localities in the Drau region of the Austrian Alps. The alternative characteristics selected were days with at least 0.1 mm of precipitation and days with less than 0.1 mm and without precipitation. Theoretically treated sequences of such characteristics are termed iterations. In such analysis the number of dry and wet periods with the given characteristics, their frequency, and the mean durations are enumerated and compared with theoretical probability. Deviations resulting from chance are analyzed. The series are analyzed by Poisson distributions. *Subject Headings:* **1. Precipitation frequencies 2. Drought periods 3. Drought frequencies 4. Drau region, Austria.**—*I.L.D.*

10.9–261 551.577.36/37

Hershfield, D. M. and Wilson, W. T., **Generalizing of rainfall-intensity-frequency data.** *International Union of Geodesy and Geophysics. Association of Scientific Hydrology, Toronto, Sept. 3–14, 1957* (*Transactions*), Vol. 1:499–506, pub. **1958.** 5 figs., table, 4 refs. **DWB**—Examination of thousands of extreme-value rainfall distributions during the past few years forms the basis for the generalizations in this paper. A table and diagram are presented for estimating the 2-yr 24 hr and 2-yr 1-hr rainfall from such readily available climatic data as mean annual precipitation, mean annual number of days of rain, and mean annual number of thunderstorm days. Duration, frequency, and area-depth diagrams are also presented which can be used to obtain any combination of relationships for 20 min. to 24 hrs duration, one to 100 yrs return period, and area up to 400 square mi. *Subject Heading:* **1. Rainfall intensity duration frequencies.**—*Authors' abstract.*

10.9–262 551.577.37(65)

*Algeria. Direction de l'Hydraulique et de l'Equipement Rural, **La pluie en Algérie. Précipitations atmosphériques exceptionnelles de l'automne 1957.** [Rain in Algeria. Exceptional atmospheric precipitation during autumn 1957.] *Terres et Eaux*, Algiers, 9(31):2–9, **1958.** 18 photos, 2 tables. **NN**—By the end of the autumn of 1957 and the beginning of the winter of 1957–1958 several exceptionally heavy and extended showers were registered. Rainwater levels rose exceptionally high in the Algerian, Kabylian and Constantine regions. Water courses were unusually swollen by these torrential rains, overflowing their beds and reaching water level marks never seen before within man's memory. Damage was particularly heavy in the Algiers region during Dec. The eastern Constantine region particularly suffered during Jan. Kabylia, the worst stricken area, was devastated by unexpected floods in Dec. and Jan. Several bridges were carried away or partially destroyed, railway tracks were pulled apart, water-gage stations installed and equipped by the Hydraulic and Rural Equipment Department were completely destroyed. The appended tables, as recorded by various climatologic stations, give a full account of the phenomenon. *Subject Headings:* **1. Precipitation 2. Excessive rainfall 3. Algeria.**—*A.V.*

10.9–263 551.577.37(753)

§Hull, Blanche B. (*Quartermaster Research and Development Command, Natick, Mass.*), **Once-in-a-hundred-year rainstorm Washington, D. C., September 4, 1939.** *Weatherwise*, Boston, 10(4):128–131 and 139, Aug. **1957.** figs., tables. **DWB**—Rainfall intensities for 2 hrs at the National Zoo in Washington, D. C. on Sept. 4, 1939 (6:45–8:45) reached a peak of 5.16 in./hour for one 5 min interval. The storm, as shown by the 0730 and 1930 synoptic charts, was due to a pre-cold frontal squall. Isohyetal maps of the District of Columbia show pattern of total rainfall, with amounts >4″ at a number of places. No storm on record exceeded this

for 5 min or 2 hrs (1848–1957). Flood and sewer damage was excessive. *Subject Headings:* **1. Rainstorms 2. Rainfall extremes 3. Washington, D. C.**—*M.R.*

10.9–264 551.577.37(437)

Petrovič, Š., **Nový maximálny denný úhrn zrážok na Slovensku.** [New record for 24-hour precipitation in Slovakia.] *Meteorologické Zprávy*, Prague, 10(6):162, **1957. DWB**—A 24-hr rainfall of 231.9 mm was measured near the Ipel'-Danube estuary on June 12–13, 1957. This is almost 70 mm more than the former record 24-hr precipitation for Slovakia. 228.5 mm fell within a 65-min period. *Subject Headings:* **1. Rainfall extremes 2. Czechoslovakia.** —*G.T.*

10.9–265 551.577.37:551.501.777

*Takenouchi, Toshio and Egawa, Taro, **Variation in storm rainfall over mountainous basin.** (**1958?**). 4 p.+tables and charts (some fold.). Mimeo. **DWB** (M78.13 T136va)—Authors deal with the problem of variation in average measured storm rainfall over mountainous basin according to the number of rain gages. Two methods—Thiessen polygon method and isohyetal method—are compared as regard to computation of average rainfall. Also examined is the relation between the point rainfall and area-average rainfall over a drainage basin which varies with the size of the governing area when a single rain-gage is located in the basin. In these cases a single storm is taken as a unit of rainfall. The total runoff is computed for each single storm, and the relation between areal-average rainfall and total runoff is taken into account. *Subject Headings:* **1. Storm rainfall variation 2. Areal-point rainfall relationships.** —*Authors' abstract.*

10.9–266 551.577.13(477)

Denisov, P. V. and Buhaĭov, A. L., **Khimichniĭ sklad doshchiv raĭonu m. Kharkova.** [Chemical composition of rainwater in the vicinity of Kharkov.] *Akademiia Nauk Ukraïns'koï RSR, Kiev, Dopovidi*, No. 2:161–164, **1957.** table, 5 refs. Russian and English summaries p. 164. **DLC** (Slavic)—Data on the chemical composition of 37 samples of rainwater taken at the Meteorological Station of Kharkov Zoo Technical Institute at 6 km from the city during 1 April 1944–1 April 1945 are presented in a table. Data on air temperature and wind force during the rain are also given. It was established that the chemical composition of samples changes both qualitatively and quantitatively during the year. Content of mineral substances varies from 21.48 to 72.52 mg/litre; variations of chemical composition are caused by hydrometeorological conditions, chiefly air temperature, wind force and direction, and thunderstorm. *Subject Headings:* **1. Chemical composition of rainwater 2. Kharkov, Ukrainian S.S.R.** —*A.M.P.*

RAIN, SNOW AND HAIL

See also: **Ice crystal forms, Arctic** (Klinov), 10.9–55; **Cosmic ray radioisotopes** (Lal et al.), 10.9–179; **Evap. rate of droplets** (Miesse), 10.9–242; **Evap. of raindrops** (Panchev), 10.9–243; **Cloud droplet size distrib.** (Shishkin), 10.9–247; **Saline nuclei** (Komabayasi), 10.9–248; **Snow crystals** (Kobayashi), 10.9–249; **Storm rainfall variation** (Takenouchi, Egawa), 10.9–265.

10.9–267 551.578.11

Litvinov, I. V., **O funktsii raspredeleniia chastits zhidkikh osadkov.** [Function of the distribution of liquid precipitation particles.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 6:838–839, June **1957.** 3 figs., table, 2 refs., 2 eqs. **DLC**—The spectral distribution of liquid droplets of varying diameter in different types of rain is described by the Poliakov-Shifrin function $\rho = Ad^2 l^{-\gamma d}$ where ρ = density of distribution of droplets of diameter d, A and γ = function of rainfall intensity. Graphs are presented showing the distribution of drops (according to diameter) in rains formed (1) by the melting of granules, (2) by the melting of granulated snow and (3) by the melting of nongranulated snow. This function is satisfactory for describing the distribution of droplets with a diameter greater than 1 mm. (For abstract on another article with same title, *see* 9.9–264, Sept. 1958, *MAB*.) *Subject Heading:* **1. Raindrop size distribution.**—*I.L.D.*

10.9–268 551.578.11:551.578.7

Litvinov, I. V., **Spektral'noe raspredelenie kapel' v dozhdiakh, obrazovannykh taianiem grada.** [Distribution spectrum of raindrops formed from melting hail.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 7:903–912, **1958.** 8 figs., 2 tables, 14 refs., eqs. **DLC**—The results of investigations of the spectral distribution of drops in rains formed by the melting of hail originally developing in clouds. The measurement of the spectral distribution of drops by means of filter paper, the exclusion of the effect of individual hail particles upon the pluviographic measurements of rainfall intensity and a device for measuring the intensity and amount of hail fall are described. The observations in the spectral distribution of rain formed from hail were made during the Elbrus expedition (in the district of the upper Baksan gorge) and in the Alazan Valley (Trana District, Georgian SSR). Since the proportion of hail was very slight it could be neglected in the spectral distribution of raindrops. Various functions describing the spectral distribution of rain from hail are compared. The distribution is described satisfactorily by the distribution function of Best, namely: $F=1-e^{-(d/a)^n}$, where F=portion of liquid water concentrated in drops with diameter less than d; a and n=constants. It is also described satisfactorily by the function derived for rain from granules and snow, namely:

$$\rho = Ne^{-\lambda d^{3/2}}$$

where ρ=density of distribution, d=diameter of drops, N and λ=function of precipitation intensity. The parameters of the spectral distribution of rain from hail cannot be expressed by a gradual function of the form $\alpha I^{-\beta}$ (I=rainfall intensity, α and β constants); instead d is described adequately by the function

$$\rho = Ad^2e^{-\gamma d}.$$

The characteristics of the spectral distribution of drops of this type are described qualitatively. And the hypothesis is confirmed, namely: that the spectral distribution of raindrops arising from hail consists of two superposed spectral distributions: (1) the spectral distribution formed from the residues of melting hail; this distribution has a maximum the position of which is determined by the evaporation of hail and its residue during its fall; and (2) distribution of droplets scattered when water is blown off from melting hail. *Subject Headings:* **1. Raindrops size distribution 2. Hailstone melting 3. Rainfall from melting hail.**—*I.L.D.*

10.9–269 551.578.11

Ouchi, K. (*Akita Univ., Akita, Japan*), **On the size distribution of raindrops, Pt. 2.** *Meteorological Society of Japan, Tokyo, Journal*, Ser. 2, 36(4):156–160, Aug. **1958.** 10 figs., ref. **DWB, DLC**—Sizes of about 167,000 raindrops in 31 rainfalls are measured by filter paper method. The time-average distributions of raindrops with size during about an hour of each rainfall are examined and classified into four types, according to the degree they are different from the equivalent Marshall-Palmer distribution which has equal rate of rainfall to them. A-type shows the distribution almost similar to the equivalent M-P-distribution, except the deficiency of drops smaller than 1.4 mm in diameter. B-type shows the excess of drops larger than about 1.8 mm, especially at the largest end of dropsizes, and remarkable deficiency of drops smaller than about 1.6 mm. Notwithstanding the excess of relatively large drops, the rain of this type has a slight rate of precipitation, not exceeding 3 mm/hr. C-type shows the excess of middle size drops in comparison with the equivalent M-P-distribution. D-Type shows the excess of drops smaller than 1.4 mm as compared with the equivalent M-P-distribution. (For Pt. 1, *see* 10.2–297, Feb. 1959, *MAB.*) *Subject Heading:* **1. Raindrop size distribution data.**—*Author's abstract.*

10.9–270 551.578.11

Shifrin, K. S., **Universal'naia formula dlia skorosti padeniia shara v zhidkosti.** [Universal formula for the fall velocity of a sphere in a liquid.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 2:280–282, Feb. **1958.** fig., table, 6 refs., 12 eqs. **DLC**—The inadequacy of the formula $v=10^6\left(\frac{0.787}{a^2}+\frac{503}{\sqrt{a}}\right)^{-1}$ cm/sec for determining the fall velocity v of a rain drop with radius a is pointed out and a general method for computing the fall velocity of any solid sphere

in a fluid based upon the universal relationship of the coefficient of resistance C_D upon the Reynolds number Re is proposed. The resulting equation $f_{res} = C_D \pi a^2 (\rho v^2/2)$ involves complicated calculation; hence a universal formula for calculating the rate of fall of a solid sphere in which the physical characteristics of both fluid and particle appear in explicit form is developed. Beginning with the formula $F(\mathrm{Re}) = (1/24)\mathrm{Re}^2 f(\mathrm{Re})$ Re is determined with the aid of the function $\phi(x)$ and the universal formula is, namely:

$$v = \frac{v_{CT}}{1 + 0.15\sqrt{\alpha a^3}} .$$

Subject Headings: **1. Drop velocities 2. Falling spheres.**—*I.L.D.*

10.9–271 551.578.11:531.52

Shupiatskiĭ, A. B., **Izmerenie skorosti i formy kapel' vody i dozhdia.** [Measurement of speed and form of water and rain drops.] *Moscow. Tsentral'naia Aerologicheskaia Observatoriia, Trudy*, No. 22:73–88, **1957.** 8 figs., table, 10 refs., 13 eqs. **DWB**—A theoretical and experimental study of the rate of fall of both natural and artificial raindrops and a simultaneous determination of their form. The discussion includes the following: theoretical computation of the vertical fall of artificial raindrops with a radius of 0.3 to 3 mm in still air; the preliminary measurement of drop sizes; computation of the influence of evaporation from the surface of drops upon their size; a description of the experimental set-up for measuring the rate of fall and dimensions of the drops; theoretical computation of the trajectory of natural raindrops and experimental measurement of the rate of fall of raindrops. In the case of the rate of fall, from heights of 0.5 to 15 m, drops with a 2 mm radius attain a constant velocity much more rapidly, while large drops attain a constant velocity only after 15 m. Also the values of the Reynolds number and the resistance coefficient were computed for moving drops and the relationship between drop form and velocity was investigated. The velocity of natural rain drop beginning with $d \geqslant 0.7$ mm is represented suitably by the formula $V = 1g8320d^{5.85}$. In radar computation, the formula for raindrops with $d > 3$ mm is $V = 5.62d^{0.22}$, and for $d <$ mm, $V = 3.84d^{0.53}$. The deviation of a raindrop from its spherical shape begins as a rule for an equivalent radius greater than 1.5–2 mm. Occasionally large raindrops undergo very slight deformation. *Subject Headings:* **1. Raindrop shapes 2. Raindrop velocity 3. Falling spheres.**—*I.L.D.*

10.9–272 551.578.4

Tolansky, S. (*Royal Holloway College, Egham, Surrey*), **Symmetry of snow crystals.** *Nature*, London, 181(4604):256–257, Jan. 25, **1958.** fig. **DWB, DLC**—The six ray star shaped crystals of snow exhibit such a remarkable symmetry that it "almost seems as if each arm of the six ray star 'knows' what the other five are doing." The crystal is assumed to be vibrating mechanically as a Chladni plate with a hexagonal symmetry. Such a mechanically vibrating system has a complex yet fundamentally hexagonal distribution of nodes and antinodes. When the water vapor molecules bombarding the growing crystal adhere on one arm the vibrations are damped. This damping is felt simultaneously at the corresponding position on the other five arms. "Hence molecules arrive and adhere easily at the other five arms on the same situations as on the first arm." The final symmetry is then explainable purely in terms of damping of localized vibrations. *Subject Heading:* **1. Snow crystal symmetry.**—*I.L.D.*

10.9–273 551.578.46(234.

Kemmerikh, A. O., **Vazhneĭshie zakonomernosti raspredeleniia snezhnogo pokrova v pripoliarom Urale.** [Most important laws of snow cover distribution in the Polar Urals] *Akademiia Nauk SSSR, Izvestiia, Ser. Geogr.*, No. 4:69–73, July/Aug. **1957.** 3 refs., table **DWB**—The differences in thickness of snow cover on the eastern (Asian) and western (European) slopes of the Polar Urals (considerably less on the former than on the latter) and the unequal distribution of snow in accordance with elements of the relief are discussed in relation to climatic and topographic characteristics. Owing to the displacement of the main watershed of the Polar Urals eastward relative to the orographic axis, a large part of the mountain range are within the limits of the European slope so that the principal winter air masses from the

est and southwest encounter high ranges before reaching the watershed and they lose most f their moisture on the windward slopes. On the Asian slope only that snow falling in the nmediate vicinity of the watershed is blown over. The effect of these differences in winter recipitation upon the water regime of the rivers of both slopes is discussed. The results of a now survey carried out by the author during March 7–25, 1956 from the Polar Urals in the orthwest to the southeast are presented. The thickness and density of the snow on both slopes re presented in a table. The total snow deposits of the western (European) slope exceed nanyfold the snow deposits of the eastern slope (Asian). The distribution of snow in the nountains of the Polar Urals is determined largely by wind blown snow and dissection of the elief. The thickness of snow cover increases with absolute height in all landscape belts, most narkedly in the mountain-taiga belt. The largest gradient of increase in depth of snow cover 70 cm/100 m) occurs on the lee slopes of ridges close to the upper forest margin. The snow ensity increases with increase in absolute height. *Subject Headings:* **1. Snow cover dis-ribution 2. Orographic effect 3. Snow density 4. Polar Urals.**—*I.L.D.*

10.9–274 551.578.46:551.507.352(473)

Rakhmanov, V. V. and Sapozhnikov, V. I., **O vizual'nom opredelenii pokrytosti basseĭnov negom pri aviarazvedkakh vo vremia snegotaianiia.** [Visual determination of the extent f snow cover in catchment areas by aerial reconnaissance during the melting period.] *Me-orologiia i Gidrologiia*, Leningrad, No. 3:58–59, March **1957.** table. **DWB, DLC**—During survey of the extent of cover of the Ugra River basin during the spring of 1955 by means of erial photography, visual estimates of the extent of the snow cover along the river were also nade. Observations were made from a height of 1000 m over an approximately square area ith a side of 1.5 km. Visual observations are not along a vertical, as in the case of the hotographic camera, but are somewhat removed from the axis of flight of the airplane. Data re presented on mean snow cover as obtained by visual observation and by a photographic amera. Visual observations give a more or less accurate estimate of the area of a snow cover. he authors discuss the reduction of systematic errors resulting from the fact that in broken ountry the snow cover is uneven (such as slopes with different exposures) as well as the voidance of random errors such as a result of dissection of the snow cover, the choice of flying outes in areas which are physiographically homogeneous, in forested areas, etc. *Subject eadings:* **1. Areal snow cover distribution 2. Visual observations from airplanes 3. Snow nelt 4. Ugra River Basin, U.S.S.R.**—*I.L.D.*

HYDROMETEOROLOGY

See also: **Floods, Great Plains, 1957** (Kutschenreuter), 10.9–21; **Soil-temp.-soil moisture rel.** (Ranga), 10.9–218.

10.9–275 551.579.4:551.509.58(571)

*Istoshina, O. A., **Formirovanie stoka Verkhneĭ Obi i metodika ego predvychisleniia.** Runoff formation in the upper Ob River and a method of calculating it.] *Moscow. Tsen-al'nyĭ Institut Prognozov, Trudy*, No. 58:101–120, **1957.** 10 figs., 6 tables, 8 refs. **DLC, DWB**—This paper contains a description of the physical geography of the Ob River basin, the tuation and direction of the Altai Mountain ranges, and their effect upon precipitation, the eneral climatic features of Western Siberia, including atmospheric circulation, temperature, ainfall during the various seasons, snow cover on the Altai, the water regime of the Ob River, c. The synoptic conditions determining spring floods on the Ob, Irtysh and Yenisei Rivers nd the method of forecasting the runoff from spring floods for the Ob River to Novosibirsk or April, May and June, for three month periods and for the winter are described. Despite ie extensive summer precipitation of Western Siberia, the river runoff during the spring-ummer period is determined by the snow deposits in the basins of the foothills and mountains. he conditions of runoff formation are uniform on the upper parts of the basins of the Ob, rtysh and Yenisei Rivers, so that forecasts can be issued for neighboring rivers. During April ie spring floods of the upper parts of the rivers of Western Siberia depend upon heat advection uring the same month in the mountainous part. During May runoff depends upon snow eposits and temperature in April, etc. Numerical data on the total precipitation for Nov.-

March at various Altai stations, runoff distribution by month, frequency of synoptic processes over Western Siberia in March, mean air temperature at 1 km elevation in April for differen types of atmospheric processes, mean air temperature anomaly in April in the Ob and Yenise basins, and graphs relating runoff to precipitation, etc. are presented. *Subject Headings* **1. Runoff forecasting 2. Synoptic conditions for spring floods 3. Ob River, U.S.S.R.**—*I.L.D*

10.9–276 551.579.4:551.588.

†Ivanov, I. V., **O vliianii lesistosti basseĭna na maksimal'nyĭ raskhod polovod'ia.** [Effec of basin forestation upon maximum flood discharge.] *Moscow. Tsentral'nyĭ Institut Prog nozov, Trudy*, No. 24(51):55–69, **1951.** 2 figs., 7 tables, 28 refs., 5 eqs. **DWB**—Various studies carried out by Soviet hydrologists to determine the validity of Voeĭkov's postulate tha the greatest influence of forest upon height of flood occurs not in complete but rather in partia forestation of a river basin. Formulas for expressing the coefficient of forestation, prepare by various investigators, are presented and are shown to assume that the greater the fores cover the greater is the diminution of maximum discharge of flood water. With the aid o numerical data and graphs, the author discusses the influence of forest cover (of various typ and age) upon snow accumulation, the conditions of snow melting and runoff in forests and th influence of degree of forestation upon the height of spring floods. Owing to the inhomogeneit of snow melting in field and in forest, and the inhomogeneity of the flow of "field" and "forest waters, the greatest influence of forest upon the decrease of maximum discharge of floods occur under natural conditions in a basin about half of which is forested. When the amount o forestation alters in both directions from this value, the forest influence diminishes. On densely forested catchment area the floods are usually higher than on a catchment area that i half forested. Both these conditions hold for moderate snow melt. *Subject Headings:* **1. Fores influences on flood discharge 2. Spring floods.**—*I.L.D.*

10.9–277 551.501.5:551.579.4:681.1

Kohler, Max A., **Mechanical analogs aid graphical flood routing.** *American Society o Civil Engineers. Hydraulics Div., Journal*, No. HY2, April **1958.** Paper 1585. 14 p. 9 figs 5 refs., 4 eqs. **DWB, DLC**—The author describes and discusses the basic features of mechanica analogs and compares the results to the graphical solutions. Graphical techniques for routin directly on the plotted hydrograph charts for four basic categories have been discussed. Amaz ingly reliable results have been arrived at without much expense of time in solving problem created by the damping effect of valley storage on a wave moving through a river reac *Subject Headings:* **1. Analog computers 2. Graphical presentation 3. Flood routing computers** —*N.N.*

10.9—278 551.482:551.579.4:631.6

Kuznetsov, V. I., **Ob izmeneniiakh stoka r. Syr-Dar'i v sviazi s razvitiem oroshenii** [Fluctuations in the flow of the Syr Darya River as related to the development of irrigation *Meteorologiia i Gidrologiia*, Leningrad, 7:17–21, July **1957.** fig., 2 tables, ref. **DWB, DLC**— In spite of the expansion of irrigation in the Fergana Valley and the increased amount of wate taken out of the Syr Darya, its flow has not diminished. Yet it is shown that while in th Fergana Valley the water content of the rivers increases, at the same time the flow in the Kol Bulak diminishes. These differences in the amount of water received by the Syr Darya fro this area as compared with that from the Begorat, Chirchik, Angren and Kelec Rivers a explained by physical geographic factors. These include the insignificant amount of groun water reaching the Syr Darya at Kok-Bulak, by the pressure of a series of stagnant accumul tions of water which are local reservoirs of ground water. The water flow into the Syr Dar as influenced by irrigation measures, the resulting change in water balance of the Fergan Valley and total water losses in the Fergana Valley are discussed with the aid of numerical dat *Subject Headings:* **1. River flow 2. Irrigation effects on river flow 3. Hydrologic cycle 4. S Darya River, U.S.S.R.**—*I.L.D.*

10.9–279 551.579.4:551.509.58:681.177(282.281..

Machado, Emilio A. M. and Marchetti, Adolfo A., **Contribución al estudio de las crecient del Río Paraná: aplicación del método de Labrouste.** [Contribution to the study of floo

the Paraná River: application of the Labrouste method.] *Meteoros*, Buenos Aires, 5(3):99–0, July/Sept. **1955.** 21 figs., 5 tables, 6 refs., numerous eqs. Spanish and English summaries 99. **DWB, DPU**—After discussing the long and short range forecasting of floods on the sis of hydrologic parameters and the various techniques employed in short range forecasting floods on the Paraná River, the authors apply Labrouste's method, which involves harmonic alysis by means of linear combination of ordinates, to long range forecasting of flood for e Paraná River using punched card machines. An appendix contains the procedure for the lculations with the aid of punched cards. *Subject Headings:* **1. Flood forecasting 2. Harnic analysis 3. Punched card applications 4. Paraná River.**—*I.L.D.*

10.9–280 551.482:551.579.4

Malik, L. K., **O gidravlicheskikh parametrakh pri opredelenii maksimal'nykh raskhodov.** Hydraulic parameters in the determination of maximum discharge.] *Meteorologiia i Gidroiia*, No. 3:40–43, March **1958.** 2 figs., table, 3 refs., 8 eqs. **DWB, DLC**—The formulas for mputing maximum discharge (in m^3/sec) and velocity of movement of flood peaks from a ter divide are—

$$Q_{max} = 3.5 b \psi^{7/6} \lambda \phi H^{1/4} m_a I^{1/4} \frac{B^{1/6}}{L^{1/2}} F$$

d

$$V = \frac{50}{L^{1/6}} H^{1/8} \lambda^{1/4} (m_\alpha^{3/2} I^{3/8} F_1^{1/4})^{7/6}.$$

this study the author analyzes those hydraulic factors of channel form and roughness, pressed by the parameter m_a. The formula for computing α—the hydraulic equivalent of a annel—is $\alpha = \frac{1}{(\mu+1)^\mu} \frac{R_1^{\mu+1} tg\theta}{2}$, where μ = index of the curve of the contour of the bottom d running sections; R = hydraulic radius for an average depth of flow equal to unity; θ = arithetic mean of angles between a horizontal line and a slope proceeding to the intersection of the ter by the lowest point of the bottom contour. The formula $\alpha \approx tg\,\theta = 2h_{max}/B_1$ is derived ere h_{max} = greatest depth of the channel and B_1 = width of the channel at its greatest depth. e variation of α with length and the application of this relationship to specific examples is ustrated. The relationship of roughness with length is given by $m = m_1 L^{1/12}$ The pameter m_α can be determined directly by the equation $m_\alpha = \frac{V^{2/3}}{15.5 I^{1/4} \left(Q \frac{F_1}{F}\right)^{1/6}}$. Graphs show- the variation of the form coefficient and of roughness with length and a table with computed lues of m_a are presented. *Subject Headings:* **1. Maximum river discharges 2. River disarge calculations 3. Floods.**—*I.L.D.*

10.9–281 551.579.4 551.48.018

Miliukova, O. A., **Opyt rascheta gidrografov vesennogo polovod'ia.** [Calculation of spring od hydrographs.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, No. 50:56–70, **1957.** igs., 3 tables, 17 refs., 9 eqs. **DLC**—Using the curves of time of travel of runoff water from a tchment area into a closed basin, since they reflect fully the conditions of flow of waters from atchment area, the author develops a method for computing the hydrograph of spring floods rivers, the basins of which are characterized by varying degrees of forest cover, swampiness d different degrees of available hydrological and meteorological data. With the aid of evant equations the author describes the computation of hydrographs of spring floods on the sis of snow supplies and mean daily air temperature and the computation of hydrographs of ximum floods. An example of computations of runoff hydrographs for the marshy and ested parts of the basins of the Tvertsa River and curves of computed and observed hydographs of spring floods are presented. *Subject Headings:* **1. Flood hydrographs 2. Spring ods 3. Runoff 4. Tvertsa River, U.S.S.R.**—*I.L.D.*

10.9–282 551.579.4(262.5

Mironova, N. Ia., **O stoke v zaliv Kara-Bogaz-Gol.** [Discharge into the Kara-Bogaz-Gol Bay.] *Meteorologiia i Gidrologiia*, Leningrad, No. 5:42, May **1957.** fig. **DWB**—A graph showing the discharge of water into Kara-Bogaz Bay over the period 1921–1956 is presented. The discharge fell from 25.8 km³/yr in 1929 to 6.0 km³/yr in 1939, since then the discharge has stabilized itself at 12–14 km³/yr. The discharge began to decline again in 1953. It is predicted that the discharge will not exceed 8 km³/yr. The discharge contributes 3% of all the water flowing to the Caspian Sea. The loss of water by the Caspian Sea at this bay is estimated. *Subject Headings:* **1. River discharge variations 2. Caspian sea.**—*I.L.D.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

10.9–283 551.58(09

†Keil, Karl, **Klimatologie Gestern, Heute und Morgen.** [Climatology yesterday, today and tomorrow.] *Meteorologische Rundschau*, 11(1):2–6, Jan./Feb. **1958.** 28 refs. **DWB, DLC**—This lecture delivered by the author on Jan. 30, 1958, in honor of the 75th birthday of Karl Knoch is a defense of climatology as a discipline, a definition of the scope of climatology, a statement of its theoretical and practical importance, a eulogy of Karl Knoch's contributions to climatology, and a brief sketch of the development of climatology in Germany. More specifically, the author discusses the climatologic study of climatic change; the special considerations involved in increasing the density of the climatological network in West Germany; the importance of "secular" and bench mark stations; the value of collections of climatologic data and the importance of climatological year books; the beginning of meteorological observations in Prussia and the influence of medical interest in such observations; the construction of a climatic atlas for Germany and its beginning in 1946 under the direction of Karl Knoch; the practical value of climatological data in aviation, indicating its fallacies; development of technical climatology (wind energy, heating, ventilation, street construction, building, etc.) and bioclimatology; and the relation of the latter to medicine. *Subject Headings:* **1. History of climatology 2. Progress in climatology 3. Knoch, Karl.**—*I.L.D.*

10.9–284 551.5

Stoenescu, S. M., **Cîteva din problemele actualeale climatologiei romîne.** [Current problems of climatology in Romania.] *Meteorologia şi Hidrologia*, Bucharest, 2(1):3–Jan./March **1957. DWB**—Among the climatological tasks confronting the Romanian Hydro-meteorological Service, the first is to establish homogeneity among data of the past. More than 600 rainfall stations have been operating since 1896, and there have been numerous interruptions and changes of location. A national network of permanent stations should be established and its continuous operation secured. A second task is the preparation of climatic maps, in which data would be extrapolated for areas lacking observations (taking into account orographic and other local factors). Another basic task is the investigation of the climate of surrounding areas, requiring cooperation and coordination. Numerous other tasks present themselves in the fields of microclimatology, agrometeorology, dynamic and aerologic climatology, etc. *Subject Headings:* **1. Problems in climatology 2. Climatological network 3. Romania.**—*G.T.*

CLIMATIC ZONES

10.9–285 551.581(477) 551.577.21:551.5

Buchinskiĭ, I. E., **Do klimatichnoho raĭonuvannia Ukraïni.** [On the climatic zoning of the Ukraine.] *Akademiia Nauk Ukraïns'koï RSR, Dopovidi*, No. 1:89–93, **1958.** 2 figs., 4 refs. In Ukrainian; Russian and English summaries p. 92–93. **DLC** (Slavic)—Isograms of moisture index showing the ratio of the annual precipitation amount (on the basis of observations at about 1000 stations for a long period) to the annual amount of evaporation from water surface (based on a map of V. I. Monhliak showing evaporation figures) plotted on a map of the Ukraine coincide, in the main, with isograms of the hydrothermal coefficient (according

T. SELIANINOV) plotted on another map. On this basis, the territory is divided into five matic zones: 1) the mountain zone with excessive humidity, 2) the northwestern with fficient humidity, 3) the central zone of unstable humidity, 4) the southern zone with in-fficient humidity, and 5) the arid coastal zone. *Subject Headings:* **1. Climatic zones 2. Cli-ate of the Ukraine 3. Ukrainian S.S.R.**—*A.M.P.*

10.9–286 551.581:631.42:541.132.3

*Franc de Ferrière, J. and Natier, E., **Zones climatiques et zones de pH des sols; leurs pports avec la potasse assimilable des sols.** [Climatic zones and pH soil zones: relationship th the assimilable potassium of soils.] *Paris. Institut National de la Recherche Agronomi-e, Annales Agronomiques*, New Ser. p. 184–209, **1933.** 12 figs., 4 tables, 14 refs. Photostat separated pages. **DWB** (613.415 F391zo)—In two previous studies the distribution of pH African soils was investigated in relation to climate, and pH contents were compared with similable potassium content. In this paper the study is extended to France and within the nits of available information, to the whole continental territory of the old world. *Subject eadings:* **1. Climatic zones 2. pH content of soil.**—*Transl. of author's abstract.*

CLIMATE OF PARTICULAR PLACES

See also: **Climate, NRTS, Idaho** (DeMarrais), 10.9–19; **Climate, Middletown, Conn.** (U. S. W. B.), 10.9–20; **Soviet Marine Atlas** (Isakov et al., *eds.*), 10.9–31; **Wind chill formulas, U. S.** (Bristow), 10.9–303; **Climate, N.W. European U.S.S.R.** (Gol'tsberg), 10.9–306.

10.9–287 551.582.2(759)

*Baum, Werner A. (*Florida State Univ., Tallahassee*), **Florida's weather and climate (1957?).** p. 23 tables. Reprinted from **The Florida Handbook,** 6th biennial ed., Tallahassee, orida, Peninsular Publishing Co., **1957.**—All that is worth while to know about the weather d climate in Florida, either for occasional visits or settling down, is found in this paper. luable tables for detailed information on temperatures, number of days with maximum above °F, record highest temperatures, daily minimum temperatures, number of days with minimum mperature 32°F or below, record lowest temperatures, number of degree days, total precipita-n, maximum monthly precipitation totals, minimum monthly precipitation totals, maximum ecipitation observed in 24 hrs, number of days with measurable precipitation, number of ys with thunderstorm, number of clear days, number of partly cloudy days, number of udy days, percentage of possible sunshine, number of days with heavy fog, relative humidity 1:30 p.m. E.S.T., prevailing wind direction, wind speed, and greatest sustained wind speed given in averages for these selected stations over very long periods: Pensacola, Apalachicola, llahassee, Jacksonville, Daytona Beach, Orlando, Lakeland, Tampa, West Palm Beach, rt Myers, Miami and Key West are presented. *Subject Headings:* **1. Climate of Florida Climatic data 3. Florida.**—*W.N.*

10.9–288 551.582(44)551.589

*†Garenc, Paule, **Contribution à l'étude du climat d'entre Loire inférieure et Gironde.** ontribution to the climatic study of the region situated between the lower Loire and Gironde.] *ance. Météorologie Nationale, Mémorial*, No. 44, **1957.** 197 p. 55 figs., 28 tables, refs., bliog. p. 183–187. **DWB, DLC**—This important work concerning regional climatology, sed on unpublished climatological archives, is composed of 4 parts. The first two parts port the climatological data gathered during the period 1926–1950 in this west central region Francé. The first part concerns precipitation and contains 4 chapters which deal succes-ely with precipitation data (67 stations), rain distribution in time, daily rain intensity and il. The author compares the pluviometry of the west central area with that of the other ench regions (periods 1891–1930 and 1926–1950). The second part reviews the other incipal elements of climate; it is subdivided into 5 chapters which are concerned with sun-ine, cloudiness, fog, temperature, frosts and humidity. The dryness of the region (Pt. 3) investigated by applying various aridity indexes and by determining its hydrologic balance means of THORNTHWAITE's method. The author does not limit herself in the climatographic udy; she tackles the climatic agro-industrial problems and delimits the climatic regions

situated between the lower Loire and Gironde. In Ch. V of the third part, the long-ran climatic changes are examined. The 4th part, which is composed of 4 chapters, constitutes synoptic climatological outline of the region. It deals successively with the paths of di turbances that affect France and peculiarly the west central area, the winds and avera isobaric situations by season, the statistics of winds, the statistics of weather types, the dai rains and the weather types. This region enjoys a climate with meridional character, with smaller intensity of precipitation, a reduced number of thunderstorms and a lesser importan of stormy rains. The heat of the chalky and sandy soils reinforces the luminosity and t dryness for the vegetation. *Subject Headings:* **1. Regional climatology 2. Synoptic climatolo 3. Loire-Gironde region, France.**—*A. V.*

10.9–289 551.582:551.585(79

*†Robison, William G. (*Regional Environments Research Branch*), **Analogs of Yuma clima in Northeast Africa (Yuma analogs, No. 2.).** *U. S. Quartermaster Research and Engineeri Center. Environmental Protection Research Div., Research Study Report,* RER-2, Aug. 19 (rev. Sept. **1957**). 20 p. 12 figs., 9 tables, 21 refs. **DWB**—Northeast Africa has considerab areas where the important climatic elements are closely analogous to those at Yuma, Ari although there are few if any places where these all coincide. Temperatures of the colde month are analogous over about the northern two-thirds of the region, reaching the Medite ranean Coast in most places. Areas where temperatures of the warmest month are analogo do not lie so far north but extend southward beyond the southern limits of aridity, merging in the perennially hot tropical regions. The highlands of Ennedi and Darfur are too cool to included. Analogous areas of the other elements plotted—mean annual precipitation, me dew point for July, and mean cloudiness for July—are confined to two transverse bands varying width, one in the north paralleling the Mediterranean coast and one in the south in t transitional area where desert gives way to tropical steppe. Areas of analogous dew points a also found in a narrow band paralleling the Red Sea coast. The vast interior of Northea Africa is practically rainless and for this reason is semianalogous to Yuma, where several inch usually fall each year. In the two bands where mean annual precipitation is closely analogo the seasonal distribution is quite different from that of Yuma, as both zones have definite w and dry seasons and the rainfall is confined to certain months of the year; only on the Red S coast near Port Sudan is the rainfall distributed throughout the year as it is at Yuma. T interior of the region is not only more arid than the Yuma desert but also has lower dew poin less cloud throughout the year, and lighter winds most of the time. *Subject Headings:* **1. C matic analogs 2. Climate of Yuma, Ariz. 3. Climate of Northeast Africa 4. Yuma, An 5. Northeast Africa.**—*Author's abstract.*

10.9–290 551.582:551.585(7

*†Robison, William C. and Dodd, Arthur V. (*both, Environmental Research Brana* **Analogs of Yuma climate in South Central Asia (India—Pakistan—Afghanistan—Iran) (Yu analogs, No. 4).** *U. S. Quartermaster Research and Engineering Center. Environmen Protection Research Div., Research Study Report,* RER-4, June, **1955.** 24 p. 12 figs., 11 tab 25 refs. **DWB**—Extensive areas of South Central Asia have summer temperatures analog to those at Yuma. Only in the extremely hot Indus Valley of Pakistan and the interior bas of Iran, and in the perennially cool mountains of Kashmir, Afghanistan, and northern I are summer temperature regimes appreciably different from those at Yuma. In winter, ho ever, the area of temperature analogy is restricted by the occurrence of temperatures hig than at Yuma in the southern part of the Indian lowlands, and by the occurrence of lo temperatures in the elevated interior of Iran. Mean annual precipitation falls within sc degree of analogy (i.e., less than 9 in.) over most of the study area. The only areas with hig rainfall are the lowland portion of India subject to monsoon rains, the northwestern part Iran bordering the Caspian Sea, and some of the higher mountains. The combined areas analogy and semi-analogy for mean July cloudiness are approximately the same as for m annual precipitation. Mean July wind speeds are likewise analogous or semianalogous at m of the stations for which values are available, being too high only at some of the coastal stati and in the vicinity of the Seistan Basin near the center of the region. Summer dew poi are analogous in a comparatively narrow band between the humid regions that are sub

maritime influences, and the dry highland regions of Kashmir, Afghanistan, and Iran. This analogous band is widest in western Baluchistan and swings northwest near the Persian Gulf east of the northwestern border of Iran. The greatest coincidence of analogy of combined climatic elements is in western Baluchistan as shown by the records of Panjgur; a similar area of nearly total analogy is found in the Indus River Valley of West Pakistan in the vicinity of Bahawalpur. The results of the study are summarized in a series of maps at the end of the report. *Subject Headings:* **1. Climatic analogs 2. Climate of Yuma, Ariz. 3. Climate of South Central Asia 4. Yuma, Ariz. 5. South Central Asia.**—*Authors' abstract.*

10.9–291 551.582:551.585(728.7–52)

†Thompson, Will F. (*Regional Environments Research Branch*), **Analogs of Canal Zone climate in India and Southeast Asia (Canal Zone analogs, No. 2).** *U. S. Quartermaster Research and Engineering Center. Environmental Protection Research Div., Technical Report EP-91,* June **1958.** 24 p. 15 figs., 9 tables, 24 refs. **DWB**—India and Southeast Asia are more variable in temperature and more seasonal in precipitation than the Canal Zone. South of 9°N, large lowland areas are analogous for mean temperature of the coldest month. Except where special conditions prevail (cloudy Bengal, the eastern piedmont of the Himalayas, and the Arabian Sea coast), lowland stations north of 15°N are too warm for analogy in the warmest month, which is usually May, just before the rainy season. Temperatures are more moderate with the onset of the summer monsoon later in the year. Nearly all of the area is analogous for precipitation amounts in the wettest month and during most of the summer monsoon season. Relative humidity is low in the driest month over most of the area, and high during the rainy season. Analogy for windiness and cloudiness of the wettest month is extensive. Because temperatures are moderate during the summer monsoon, multiple analogy with the Canal Zone is extensive at that time. Year-round multiple analogy is limited to the southern part of the area. Areas of such analogy with Balboa Heights (on the Pacific side of the Canal Zone), which has well-marked seasons, are in Ceylon, southernmost India, Malaya, Laos, South Vietnam, and Cambodia. Year-round composite analogy to Cristobal occurs only in Malaya. Areas of analogy are given in 14 maps; the last 2 maps show the distribution of multiple analogy. *Subject Headings:* **1. Climatic analogs 2. Climate of Canal Zone 3. Climate of India 4. Canal Zone 5. India.**—*Author's abstract.*

CLIMATIC CHANGES

See also: **Met. confs., U.S.S.R.** (Buchinskiĭ), 10.9–69; **Long period circul. variations** (Gregor, Krivsky), 10.9–197.

10.9–292 551.583(899)

*Tiscornia, José, **Ha variado nuestro clima?** [Has our climate changed?] *Revista Meteorológica*, Montevideo, 14(50/51):7–13, June/Dec. **1956.** 5 tables. **DPU**—On the basis of a comparison of temperature and precipitation data for the periods 1883–1897, 1901–1950 and 1951–1955, the author concludes that there is no evidence of a change in average climatic conditions of Uruguay but the climate has changed in respect to extreme conditions which have become more frequent and wider in range. *Subject Headings:* **1. Climatic variations Uruguay.**—*G.T.*

10.9—293 551.583.3:581.33

Davis, Margaret Bryan, **Three pollen diagrams from central Massachusetts.** *American Journal of Science*, 256(8):540–570, Oct. **1958.** 8 figs., 3 plates (2 fold.), refs. **DWB**—Three pollen diagrams are presented from central Massachusetts. The diagrams are believed to record the vegetational sequence from the time of retreat of pre-Valders ice to a time just previous to European colonization. They are interpreted to show that a narrow treeless belt along the edge of the retreating ice was rapidly colonized by forest. During Two Creeks time cool-temperate, and perhaps dry, climate permitted the growth of a mixed spruce and deciduous forest. The climate during the Valders stadium became cooler and more moist, and brought about a change in the frequency of the forest species. An alternative interpretation, according to which a return of park-tundra vegetation, under conditions of intense solifluction,

occurred in Valders time, is not favored by the weight of evidence. The succeeding pine phas has been divided into two zones, the second of which was probably warmer and drier than th first. The three deciduous forest zones described from other parts of New England have bee demonstrated, although only one of the diagrams contains the entire sequence. The dominan pollen types in the three zones, starting with the earliest, are: oak and hemlock, oak, pine, an hickory; birch, oak, hemlock, and chestnut. The upper part of the pine zone and the firs two deciduous forest zones are believed to represent the hypsithermal interval. On the basi of the bog plant pollen spectra, the beginning of the third deciduous forest zone is though contemporaneous with the beginning of the Sub-Atlantic pollen zone in Europe. *Subje Headings:* **1. Pollen analysis 2. Central Massachusetts.**—*Author's abstract.*

10.9–294 551.583.7:539.16:546.26:551.79

†Flint, Richard Foster and Gale, W. A., **Stratigraphy and radiocarbon dates at Searle Lake, California.** *American Journal of Science*, New Haven, Conn., 256(10):689–714, De **1958.** 5 figs., 2 tables, 37 refs. **DWB**—Upper units of the strata beneath Searles dry lak in a desert basin in southeastern California, record two deep lakes each followed by precipitatio of evaporites and at least near-desiccation. Each lake is thought to imply a pluvial climate the times of near-desiccation represent the warmer, drier, nonpluvial climate of today. C dates of samples from these strata show that the later of the two pluvial climates lasted fro before 23,000 to ~10,000 yr B.P.; it was therefore contemporary with the classical Wiscons glaciation of central U. S. The earlier pluvial had been well established by ~46,000 B.P. an had begun to wane before ~32,000 B.P. The later history of the lake in the Searles basin in agreement with the published data on the later history of Lakes Bonneville and Lahonta Still earlier lake fluctuation can be discerned in underlying strata, but these are not controll by dates. *Subject Headings:* **1. Radiocarbon dating 2. Glacial deposits 3. Searles Lak Calif.**—*Authors' abstract.*

MICROCLIMATOLOGY

See also: **Cold deserts, Antarctica** (Avsiuk et al.), 10.9–59.

10.9–295 551.584.61:631

Kešner, B., **Das Studium des Mikroklimas von Ställen in der Tschechoslovakei.** [Stu of the microclimate of barns in Czechoslovakia.] *International Journal of Bioclimatology a Biometeorology*, Leiden, Vol. 1 (Pt. 3, Zoological Bioclimatology), **1957.** 2 p. **DLC** (QH543.I —The author presents a general account of the results of studies on the microclimate of bar with special consideration of temperature, humidity, air flow, ventilation and concentrati of noxious gases; ammonia, sulfur dioxide, carbon dioxide. The principal fault of barn clima is not inadequate ventilation but inadequate heat insolation. Another defect is the excessi atmospheric humidity. The fall in the temperature of barns does not have a linear relatio ship to the outside temperature; instead at a barn temperature equal to the temperature the interior surfaces (dew point) the dependence of the interior upon the outside temperatu breaks and a sudden drop in the barn temperature occurs. The application of this fact barn construction, ventilation etc. is discussed. *Subject Headings:* **1. Barn microclimatolo 2. Heating and ventilating 3. Barn climates.**—*I.L.D.*

10.9–296 551.584.61:69

Saito, Hirohide, (**Comments on**) **Kiyoshi Akai: Meteorological study on heating a forecasting of room-temperature.** *Journal of Meteorological Research*, Tokyo, 9(7):542, J **1957. Reply** by Akai, p. 542–543. In Japanese. **DWB, DLC.** Original article in *Ib* 8(10):622–626, **1956.**—The comments are given on the interpretation of the ratio of the h heat coefficient to the total heat quantity of a room, and on the influence of heat loss under floor and at floor edges to the applied equation. The reply is made in clarification of comments. *Subject Headings:* **1. Room temperatures 2. Heating of houses.**—*J. Woo.*

10.9–297 551.584.9:551.586:35

*Miller, Vincent P. (*Regional Environments Research Branch*), **Microclimatic observati at missile sites.** *U. S. Quartermaster Research and Engineering Center. Environmental I*

ection Research Div., Research Study Report, RER-22, July **1958.** 15 p. 3 figs., 4 tables, refs. **DWB**—This report gives the results of microclimatic measurements made during fueling and defueling operations at 44 NIKE (AJAX) installations located in or near several major cities in the U. S. Measurements were made under three main types of climatic conditions: cold, temperate, and warm-humid. Windchill, large vertical temperature differences, and rapid changes in temperatures near the ground, (encountered during the initial cold-weather phase), subjected military personnel to considerable climatic stress. In temperate climates, unnecessarily high temperatures resulted at some sites where revetment orientation did not provide for maximum air circulation. At these sites oppressive temperatures were encountered during the warm-humid phases of the investigations. Average recorded temperatures at 11 of the 14 NIKE fueling areas in cold climates were from 13.9 to 0.5F° colder than official meteorological observations obtained from nearby Weather Bureau or U. S. Air Force stations. At the remaining sites average recorded temperatures were 0.5 to 3.9F° warmer than official average temperatures. Temperatures recorded during the temperate and warm-humid phases corresponded more closely to those officially reported. Average temperatures at the missile sites were colder during 5 of the 9 temperate climatic observations, and warmer during 9 of the 16 warm-humid periods. *Subject Headings:* **1. Missile site microclimatology 2. Military climatology 3. United States.**—*Author's abstract.*

CLIMATIC CLASSIFICATION

See also: **General circul. and synoptic climat.** (Dzerdzeevskiĭ), 10.9–193; **Climatic analogs., Yuma, Ariz. and NE Africa** (Robison), 10.9–289; **Climatic analogs, Yuma, Ariz. and So. Central Asia** (Robison, Dodd), 10.9–290; **Climatic analogs., Canal Zone and India** (Thompson), 10.9–291.

10.9–298 551.585(522)

Araki, K., **A new expression of climate.** *Journal of Meteorological Research*, Tokyo, (1):47, March **1956.** 2 figs. In Japanese. **DWB, DLC**—M.H. method is applied for treating statistically data of air temperature and rainfall in Miyazaki Prefecture, M.H. method is comparing degree of autocorrelation of other stations' data with one station's representative values of air temperature and rainfall for a certain period. Degrees of autocorrelation of 15 different stations (weather) with data of April–Sept. and Oct.–March show that Miyazaki Prefecture can be divided into one coastal and two mountain areas (three weather districts). Degrees of autocorrelation among the three districts are low but the feasibility (of weather districts) is to a certain degree affirmative. *Subject Headings:* **1. Climatic classifications 2. M.H. method 3. Miyazaki Prefecture, Japan.**—*J. Woo.*

10.9–299 551.585.5(47)

Fel'dman, Ia. I. and Chubukov, L. A., **Primenenie metoda kompleksnoĭ klimatologii k izucheniiu klimata aridnykh i ekstraaridnykh oblasteĭ SSSR.** [Application of the method of complex climatology to the study of the climate of arid and super-arid regions.] (In: Vsesoiuznoe Geograficheskoe Obshchestvo SSSR, **Voprosy Geografii.** Moscow, **1956.** p. 152–159. refs.) **DWB, DLC** (G58.G35)—The authors state that the study of climate by methods of complex climatology carried out in various natural zones of the Soviet Union shows that every one has an inherent, clearly expressed, structure of climate. The arid and extra-arid regions are distinguished by high recurrence of dry wind-arid and moderately arid weather. A comparison of graphs of climate structures for Central Asian deserts and semi-deserts of southeastern European U.S.S.R. shows clearly both the inter-zonal differences (desert-semi-desert) and the changes in climate taking place under influence of irrigation (desert oasis). They proceed then to examine the peculiar features of summer weather for those regions. *Subject Headings:* **1. Arid zone climatology 2. Complex climatology 3. U.S.S.R.**—*A.M.P.*

10.9–300 551.585.5

Gilead, M. and Rosenan, N. (*both, Israel Met. Service*), **Climatological observational requirements in arid zones.** *UNESCO Arid Zone Research*, No. 10:181–188, **1958.** table,

15 refs. **DWB, DLC**—In arid lands where long observation periods and well distributed networks are absent, special requirements arise for making climatological observations. The first on climatology in arid zones will be the intensification and normalization of climatological networks on the fringes of deserts. For the investigation of regional climates with a view to their classification and climatic fluctuations, short term climatological stations and rainfall stations within an area having at least one basic climatological station could be established. Where this is impossible pedological, ecological and archaeological evidence can be used to determine climatic characteristics. For the study of local climates (topoclimatology) observational requirements differ from the basic climatological and rainfall networks. The elements to be observed at climatological stations in arid zones are listed in a table, and notes explaining the application of climatological instrumentation in arid zones are presented. These notes are based on the **Guide to International Meteorological Instruments and Observing Practices** (*WMO Publication*, No. TP.3). These notes cover various aspects of radiation, soil temperatures, screen air temperature, rain, weather, humidity of surface air, potential and actual evaporation, etc. *Subject Headings:* **1. Arid zone climatology 2. Climatological networks 3. Arid zones.**—*I.L.D.*

10.9–301 551.585.7

Chubukov, L. A., **Osnovnye zakonomernosti vertikal'noĭ zonal'nosti v rezhime mestnoĭ pogody v gornykh raĭonakh SSSR.** [The main regularities of vertical zonation in local weather regime of mountain regions of the U.S.S.R.] *Lietuvos TSR Mokslu Akademija. Geologijos ir Geografijos Institutas, Moksliniai Pranešimai*, 5:83–88, **1957.** 5 refs., 3 tables. **DWB**—Some specific methods of research applied to complex climatology studying regularities of formation and distribution of local weather conditions in the mountainous regions of the country are given. The usefulness of proposed schemes: 1) of horizontal profiles of weather conditions along narrow river valleys and 2) of profiles on different heights for slopes of mountains of different exposures are given. The regularities of vertical zonation in weather conditions during warm and cold periods of a year in the mountainous regions of Southern U.S.S.R. are described. *Subject Headings:* **1. Local weather studies 2. Mountain climatology 3. U.S.S.R.**—*Author's abstract.*

BIOCLIMATOLOGY

See also: **Bioclimat., Soviet Arctic** (Danishevskiĭ), 10.9–24; **Missile site microclimat., U. S.** (Miller), 10.9–297.

10.9–302 551.586:631.4(866)

Frei, Erwin, **Eine Studie über den Zusammenhang zwischen Bodentyp, Klima und Vegetation in Ecuador.** [Study on the relation between soil, climate and vegetation in Ecuador.] *Plant and Soil*, The Hague, 9(3):215–236, March **1958.** 4 figs., 8 refs. English summary p. 235. **DLC**—Nine important soil groups of Ecuador are described. They belong to the associations of desert soils, black and brown tropical soils, Latosols, and dark mountain soils. Climatic differences have been recognized as the main reason for these widely varying soil formations. The soil formations reflect clearly the distinctions in annual precipitation and monthly rain distribution. The soil profile and the vegetation cover seem also to be greatly influenced by differences in the mean annual temperature depending on the altitude above sea level. *Subject Headings:* **1. Soil classification 2. Climate influences on soil 3. Ecuador.**—*A. V.*

10.9–303 551.586:612(73):551.582.1

Bristow, Gerald C. (*Climatological Services Div., U. S. W. B., Wash., D. C.*), **How cold is it?** *U. S. Weather Bureau, Weekly Weather and Crop Bulletin*, 42(48):6–8, Nov. 28, **1955.** 6 figs., table. **DWB**—A wind chill factor is worked out (nomogram) and applied to climatic data for the U. S. Graphs of the annual and diurnal variations of wind chill in selected cities, and a wind chill factor chart of the U. S. for January are presented. *Subject Headings:* **1. Wind chill formulas 2. United States.**—*G.T.*

10.9–304 551.586:615.838(4)

Gregor, A. (*Czechoslovakia*), **Ein Beitrag zur Klassifikation der Ortsklimate in Mitteleuropa für balneologische Zwecke.** [Contribution to the classification of local climates of central Europe for balneological purposes.] *International Journal of Bioclimatology and Biometeorology*, Leiden, Vol. 1 (Pt. 4, Human Bioclimatology), **1957.** 2 p. **DLC** (QH543.I5)—While the most favorable climatic health resorts in Europe are, according to DORNO, situated at elevations of 1001–2000 m, there are localities at lower elevations which may be good resorts. The problem discussed by the author is that of establishing criteria for grading climatic health resorts. The characteristics of climatic health resorts, air health resorts and recuperation resorts are discussed. Climatic health resorts are designated for resorts of the highest quality where usually high pressure weather prevails. Air resorts occur in regions where föhn weather prevails on the slope and at the foot of the Alps. During SW to SE weather situations, as a result of an anticyclone over central or southeastern Europe, there occur high inversions with stratus clouds below 1000 m level, especially during transitional seasons; high mountain localities and also the northern slopes of the Mittelgebirge are free of these phenomena as a result of either actual or free föhn. Upon these slopes there develops the downslope wind with the characteristics of föhn; the wind removes the inversions and scatters the stratus clouds so that sunny weather develops. The bioclimatic aspect of these weather conditions is discussed for the resort of Luhacovce (Czechoslovakia). Recuperation resorts are becoming more important since the weather in air polluted cities differs sharply from that in the country. Climatologically they have no special features except that during the summer they must have fresh clean air, fresh water and parks and forests. *Subject Headings:* **1. Local climatic studies 2. Climatic classifications 3. Health resorts 4. Luhacovce, Czechoslovakia.**—*I.L.D.*

10.9–305 551.586:615.838

Hentschel, G., **Bioklimatologie im Kurort.** [Bioclimatology at resorts.] *Angewandte Meteorologie*, 3(3):68–74, April **1958.** 4 figs., ref. **DWB**—The utilization of climatic data in physical therapy requires a physiological evaluation of the climatic material. This is illustrated by the temperature-humidity relationship of UNGEHEUER. The use of this concept to classify climatic resorts is illustrated by plotting the diurnal and interdiurnal vapor pressure upon probability paper and their plotting frequencies of climatic curves associated with the vapor pressure frequencies. The physiological evaluation of climatic data has been carried out for Potsdam and is applied to the entire German People's Republic. This procedure is valid because the meteorological variations are greater at a given place than between places and the climatic resorts are located within an essentially average climate. Significant are, however, the variations in the weather situations and elements which vary from place to place. The need to consider purely synoptic and climatic considerations in climatic therapy is stressed by an illustration showing the significance of the annual rhythm of physiological processes in cures of pimpliness and bronchitis. *Subject Headings:* **1. Resort climatology 2. Health resorts 3. Potsdam, Germany.**—*I.L.D.*

10.9–306 551.586:635:551.582.2(472)

Gol'tsberg, I. A., **Klimaticheskie usloviia ovoshchevodstva na severozapade evropeĭskoĭ chasti SSSR.** [Climatic conditions of vegetable culture in the northwest European U.S.S.R.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvestiia*, 89(6):536–542, **1957.** 6 tables. **DLC**—The author discusses the physical geographic factors determining the climate of northwestern European Russia (Pskov, Novgorod and Velikie Luki Oblasts), especially the role of terrain in the microclimatic and climatic features. Soil temperatures and humidities and air temperatures corresponding to the sowing of various vegetable crops are discussed in detail, and data are given on the climatic dates for beginning of mass sowing of the basic vegetable crops (fodder crops, potatoes, cucumbers), variation in the length of period, and temperature sums from mean daily temperatures above 10, 12 and 15°C according to latitude and height above sea level, frequency of temperature sums per year, thermal indices of vegetable crops of northwestern European Russia, time of arrival of mean daily temperatures below the indicated levels, time of occurrence of autumn frosts, and climatic indices of vegetable cultivation for Pskov, Novgorod and Velikie Luki oblasts. *Subject Headings:* **1. Climate of North-West**

European S.S.R. 2. Soil climatology 3. Climatic factors in vegetable growing 4. European S.S.R.—*I.L.D.*

UPPER AIR CLIMATOLOGY

See: **Aeroclimatology, Ukraine, U.S.S.R.,** 10.9–26; **Monsoons, Far East** (Gavrilova), 10.9–226.

ENVIRONMENTAL INFLUENCES

See: **Topoclimate, Middletown, Conn.** (U. S. W. B.), 10.9–20; **Nocturnal cooling in cities** (Yamamoto), 10.9–206; **Forest infl. on soil freezing** (Pierce), 10.9–222; **Forest infl. on flood discharge** (Ivanov), 10.9–276; **Urban influences on visibility, London, Eng.** (Bonacina, Carter), 10.9–309.

SYNOPTIC CLIMATOLOGY

See: **Synoptic climatology, Loire-Gironde Region, France** (Garenc), 10.9–288.

MISCELLANEOUS

COSMIC INFLUENCES

See also: **Solar-climatic rel.** (Gregor, Krivsky), 10.9–197.

10.9–307 551.590.2

Klein, M. and Robinson, N., **Solar eclipse of Feb. 25, 1952: its influence of the insolation and on various meteorological elements.** *Israel. Meteorological Service, Series A, Meteorological Notes*, No. 11, **1955.** 12 p. 9 figs., 5 refs., eqs. **DLC**—Variations of solar radiation, relative brightness, global radiation, infrared and ultraviolet intensity, diffuse sky radiation, air temperature, relative humidity, vapor pressure, wind velocity and direction and air pressure during the eclipse are studied. Some results are compared with W. BLEEKER's theory of differential heating at a cooled strip. *Subject Headings:* **1. Solar eclipse, Feb. 1952 2. Solar eclipse effects on meteorological elements 3. Israel.**—*A.A.*

10.9–308 551.590.25:621.396.

Chubb, H. E., **Development of meteor burst communication systems for the Navy.** San Diego, Calif., U. S. Navy Electronics Lab., **1958.** (4 p.) 10 figs. incl. photos., 7 refs. Reprinted from *National Convention on Military Electronics, 2nd, 1958, Conference Proceedings* p. 266–269. **DWB** (reprint file)—Transmissions at 43.5 Mc from Palo Alto, Calif. were monitored at NEL, San Diego, a distance of 690 km and aboard a Navy vessel off-shore in the San Diego area. The received meteor burst signals were analyzed to determine the expected duty cycle and design requirements of a meteor burst link between these two locations. A simple closed loop system was developed and tested at NEL with the Palo Alto station being used as a repeater. Teletype information transmitted in high speed bursts was received, processed, and the causes of errors were analyzed. A more sophisticated system was developed to provide duplex operation. One end of the link was installed in a mobile van and is being tested at distances of approximately 400, 700 and 1100 miles. Signals received at San Diego from these test locations will be correlated with those received from the fixed station at Stanford. *Subject Heading:* **1. Meteor burst communication systems.**—*Author's abstract.*

VISIBILITY

10.9–309 551.591:551.588.7(42

Bonacina, L. C. W. and Carter, C. I., **Summer evening visibility over London in 195** *Weather*, London, 13(4):125–127, April **1958.** table. **DWB**—A summary of 8 successive years of visibility observations over London using a 5 point code denoting visibility of not visibility of St. Paul's Dome, the North Downs scarp line, etc. Data are given as means, an

number of "5's" or excellent visibility cases each month (May–August) of each year, 1950–957, incl. May is the poorest and August the best month for both mean and good visibility, ut in a 3 year study of visibility from Hampstead looking toward the city and toward the ountry, it was shown that May was as good, and in 1956 the best month of the four, indicating hat city smoke is dissipated more in summer than in spring, whereas in the country spring s not subject to these smoke reductions and comes out better. *Subject Headings:* **1. Visibility ver London 2. Seasonal visibility variations 3. Urban influences on visibility 4. London, ng.**—*M. R.*

OPTICAL PHENOMENA

See: **Refractive index models** (Bean, Thayer), 10.9–176; **Fog transmission and Mie theory** (Arnulf, Bricard), 10.9–208.

ELECTRICAL PHENOMENA

See also: **Convective cloud electrification, European U.S.S.R.** (Imianitov), 10.9–162; **Night airglow and auroras** (Krasovskiĭ), 10.9–215.

10.9–310 551.594.221:550.38

Norinder, Olov and Knudsen, Edgar, **New method of measuring rapid magnetic field ariations from atmospheric electric discharges by using a loop system on the earth's surface.** *rkiv för Geofysik*, Stockholm, 2(23):481–499, **1957.** 22 figs., 8 refs., 2 eqs. **DLC**—The nderlying theory of the new method and the experimental procedures are outlined. Greater ensitivity and less expense are the main advantages in comparison with the oscilloscope. Discharge variations in lightning strokes are shown. Electric field variations measured by the pen antenna method were found to be in good agreement with oscillographic investigations f the magnetic field's variations caused by lightning strokes at distances between 300 to 700 m. Statistical studies of wave length ranges are presented as well as a great number of com-arative original records. *Subject Headings:* **1. Atmospheric electricity 2. Magnetic field ariations during lightning 3. Magnetic field measurement techniques.**—*A. A.*

10.9–311 551.594.221

Wagner, C. F. and Hileman, A. R., **The lightning stroke.** *American Institute of Electrical ngineers, Transactions*, 77(3):229–242, June **1958.** 19 figs., 30 refs., 20 eqs. **Discussion,** 240–242. Abstracted from photostat of separated sheets. **DWB** (M94.221 W13291i)—rom the observed data on stroke-current crest magnitude as a direct source from lightning ffect on transmission lines, the authors have graphically compared the laboratory results ith the actual in order to determine whether the time to crest of lightning currents of the der of 20,000 or more amperes is about 0.2μ sec or greater than 1.0μ sec. *Subject Heading:* **Lightning strokes.**—*N. N.*

10.9–312 551.594.223

Brown, G. H., **Ball lightning.** *Meteorological Magazine*, London, 86(1026):375, Dec. **1957.** **WB**—Seen while motoring on a highway across the Mendips, by author and wife on June), 1957, at 2:30 p.m. in very heavy rain. The ball came after lightning struck 100 yds away the left. The ball appeared 200 yds ahead and slightly to the right, as a bright, round globe light a few feet above the ground and sinking slowly to the ground in a few seconds, when disappeared. *Subject Headings:* **1. Ball lightning 2. Mendip Hills, Eng.**—*M. R.*

AURORAS

10.9–313 551.594.51:551.521.64

Cosmic-ray balloon experiments: soft radiation associated with auroras and geomagnetic tivity. *American Geophysical Union, Transactions*, 39(2):377–380, April **1958.** 2 figs. **WB, DLC**—Several scientists have been working on the presence of new "soft" (low energy) diation at altitudes above 50 km since the summer of 1953. Such radiation is created in the mosphere as in the case of low-energy cosmic rays themselves. Observations of auroral

radiation during the IGY of 1957 were reported in *AGU Trans.*, Dec. 1957; *see* 10.8–54, Oct 1959, *MAB*. WINCKLER and PETERSON favor the assumption that the soft radiation observed in their experiments originates from 60 Kev electrons. KINSEY ANDERSON from Fort Churchill Manitoba has proven that there is a close interrelation of cosmic rays, soft radiation, and geo magnetic activity. He concludes that electrons presumed to give rise to x-rays are quickened near the earth's surface rather than on the sun. *Subject Headings:* **1. Cosmic ray origin 2. Auroral radiations.**—*N.N.*

10.9–314 551.594.51:535.33(44)

Dufay, M. and Moreau, G., **Spectre de l'aurore du 21 Janvier 1957.** [Spectrum of the aurora of Jan. 21, 1957.] *Annales de Géophysique*, Paris, 13(2):153–154, April/June **1957.** fig. 5 refs. **DLC**—The great aurora of Jan. 21, 1957 was clearly observed from the Haute-Provence Observatory, France between 20h and 23h 40 T.U. Its greatest activity was immediately after 22h 45. The most salient feature of the auroral spectrum was the intensification of the bands 9–4 and 5–1 and the presence of a maximum around 7850 Å. This is attributed to the 2–0 band of the $A^2\pi - X^2\Sigma$ system of the N_2^+ molecule discovered by MEINEL in low latitude auroras. *Subject Headings:* **1. Auroral spectra 2. Auroral radiation 3. Haute-Provence France.**—*N.N.*

10.9–315 551.594.51:535.3

Karandikar, R. V., **Improvement of spectroscopic recording techniques.** Boston Univ Physical Research Labs., Contract AF 19(604):857, Final Report, March 1, **1957.** 15 p 10 refs. **DWB** (M08.9 B747im)—This report summarizes briefly work which has been done under the contract for improving spectrographic and photographic data from night sky and aurora: 1) a wide-aperture cylindrical collecting system; 2) study for dispersing and detecting systems for the infrared; 3) same for the ultraviolet; 4) the Ebert-Fastie system (monochromator); 5) study of the auroral N_2^+ band at 3914 Å, especially at twilight, vertical intensity gradients of auroral radiations, interferometry of the aurora and airglow; 6) work planned for IGY on UV auroral spectrum measurements, altitude profile of aurora, Doppler width of 5577 Å line and an interferometric survey of Hα in aurorae. *Subject Headings* **1. Auroral spectroscopy 2. Interferometry of aurora and airglow.**—*M.R.*

10.9–316 551.594.51:551.510.535:551.501

Lied, F. (*Norwegian Defence Res. Establishment*), **Quantitative measurements of absorption in the auroral zone.** (In: Polar Atmosphere Symposium, Oslo, July 2–8, 1956, **Proceedings Pt. 2, Ionospheric Section.** N. Y., Pergamon Press, **1958.** p. 135–146. 14 figs., 11 refs. Also issued in *Journal of Atmospheric and Terrestrial Physics*, London, Special Supplement Pt. 2, 1957, pub. **1958?** p. 135–146. **DLC**—In the study of "normal" auroral absorption as well as the disturbances, we need the application of different techniques with overlapping sensitivity since the observational phase in connection with ionospheric absorption is not terminated. The statistical distribution in time and space of the more catastrophic blackout a little of the real nature and cause of the general and excessive high absorption due to some ionizing mechanism, and the techniques for locating where in the ionosphere the excessive absorption takes place, as well as the magnitude of the extra ionization, have been covered in this paper. Techniques include the CW-oblique measuring, the pulse-amplitude, the Galactic the cross modulation techniques, all of which must be used contemporaneously and forced to overlap as in the ionospheric recordings made in Canada, Alaska and Norway. *Subject Headings:* **1. Auroral absorption 2. Ionospheric absorption measurement techniques.**—*N.N.*

SFERICS

10.9–317 551.594.6:621.396.

Kawakami, Kinnosuke and Akima, Hiroshi, **New method of measuring the effective value of band-limited radio noise voltage.** *Japan. Radio Research Laboratories, Journal* 3(11):109–113, Jan. **1956.** 3 figs. **DWB**—A suggestion is offered on a new method of measuring the effective value of band-limited radio noise voltage having a wide dynamic range of the envelope. This method is for obtaining the mean square value of noise voltage by linear

detecting and smoothing after doubling the frequency of noise voltage by the use of nonlinearity of the static characteristics of pentode tubes. *Subject Heading:* **1. Radio noise voltage measurement.**—*Authors' abstract.*

10.9–318 551.594.6:551.510.62:551.510.535

Srivastava, R. S. (*Physics Dept., Banaras Hindu Univ.*), **Amplitude variations of the successive reflections of an atmospheric pulse between the ionosphere and the earth.** *Journal of Scientific and Industrial Research, Ser. B.*, New Delhi, 16(10):475–477, Oct. **1957.** 2 figs., 2 eqs. **DWB, DLC**—Recent research at the Dept. of Physics in the Banaras Hindu Univ. has led to the conclusion that an approximate estimate can be made, under suitable conditions, of the inclination of the lightning channel if the height of the ionospheric reflection and the distance of the lightning discharge are known. Observed variation of the relative amplitudes of the successive atmospheric pulses must be analyzed in relation to their reflection from the ionosphere to obtain the desired results. A mathematical approach to this field is illustrated. *Subject Headings:* **1. Ionospheric reflection 2. Sferics propagation.**—*N.N.*

PART II. ANNOTATED BIBLIOGRAPHY ON EVAPOTRANSPIRATION (–1955)

Compiled by: *Geza Thuronyi*

INTRODUCTORY NOTE

This is the second in a series of bibliographies on evaporation. The first, published in the August (1959) issue of Meteorological Abstracts and Bibliography, included material on instruments and methods for evaporation measurement. This second deals with the measurement and computation of regional and local evapotranspiration, results of such measurement, and application of evapotranspiration calculations to climatic classification, water balance studies, etc. The period covered is essentially 1950–1955. Earlier material was published in a previous bibliography on evaporation (*Meteorological Abstracts and Bibliography*, 1(11):733–762, Nov. **1950**). The period 1956–1959 has been reserved for our next issue. Finally, the subject of evaporation from various surfaces not involving plant cover will be dealt with in the last bibliography of this series. That bibliography will also contain a combined **Outline of Contents** including all items in this series of four bibliographies.

This bibliography was prepared for and with support from the U. S. Army Electronic Proving Ground, Fort Huachuca, Arizona.

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1911

10I–1 551.5:631.4 551.57

†Loske, E., **Obzor rabot po sel'skokhoziaĭstvennoĭ meteorologii i po voprosam s neiu sviazannym Chast' I. Otnoshenie pochvy k meteorologicheskim faktoram.** [Survey of studies on agricultura meteorology and problems related to it, Pt. 1, Relation between soil and meteorological factors.] *Trudy po Sel'skokhoziaĭstvennoĭ Meteorologii,* Leningrad, v. 8–17, **1911–1917.** 914 p. tables, ref

DLC—One of the more comprehensive earlier scientific surveys on the interaction between soil an atmosphere, based on a large number of works published mainly in Russian and German. Autho discusses soil temperature on the surface and in deeper layers, heat capacity and other heat properties influence of vegetative cover, rainfall and snow, fertilizers and microclimatological peculiarities an gives samples of observations. Ch. 2 deals with the influence of frost on the soil (soil fertility, com pactness, structure, air and water permeability, etc.). Ch. 3–4 deal with moisture in the so (moisture capacity, hydroscopy, dew in the soil, movement of moisture, infiltration and percolatio capillary moisture). Sixty-five pages are devoted to evaporation from soil and drying of th soil. Ch. 5–7 (283 p.) of this fundamental work, published in Vol. 11 (1915), deal with the r lation of percolation to precipitation and with the influence of precipitation and snow cover o soil. Ch. 8–10 (279 p.) are published in Vol. 17 (1917); information on contents not availabl A second part dealing with the influence of meteorological factors on plants was never publishe (*Same item as* 4C–87, March 1953, *MAB.*) *Subject Headings:* **1. Soil—atmosphere interacti 2. Frost effects on soil 3. Soil temperatures 4. Soil moisture 5. Evaporation from soil.**—*A.A.*

1944

10I–2 551.579:551.588

*†Stålfelt, M. G., **Granes vattenförbrukning och dess inverkan på vattenomsättningen i marke** [Water consumption of the spruce and its influence on the water economy in soils.] (*K.*) *La bruksakademien, Stockholm, Tidskrift,* 83(6):425–505, **1944.** 14 figs., 20 tables, bibliog. p. 503–50

DLC—Results of measurements (1938–41) of transpiration and interception of eleven 40-year-o spruces, 8 of which grew where depth to groundwater was 2–7 m and 3 where it was only 0.2 m, a

resented tabularly and discussed. Evaporation exceeds precipitation. Comparative measure-ients show that the precipitation (May–Aug.) reaching the root system was 43% and 24% of the ranspiration from the trees in the dry and the moist ground, respectively. (*Same item as* 8.6–95, une 1957, *MAB.*) *Subject Headings:* **1. Forest hydrology 2. Hydrologic cycle 3. Transpiration f forests.**—*W.N.*

1946–1949

10I–3 551.573:536.42

†Penman, H. L., (*Rothamsted Experimental Station, Harpenden, Herts*), **Evaporation in nature.** *'hysical Society of London, Reports on Progress in Physics,* 11:366–388, **1946/1947.** 5 figs., 47 eqs., ibliog. p. 387–388. **DWB**—Valuable survey of literature (based on some 90 papers) on the history f evaporation research, theory of evaporation (aerodynamic approach and energy balance), evap-ration measurements (open water, bare soil, cropped soil and catchment areas). Detailed discussion s devoted to the "power law" of evaporation, evaporation theory of FROST (1946), ROHWER'S vaporation studies, pressure influence on evaporation and author's own studies on soil evaporation. ummer evaporation increases with the frequency of re-wetting. Evaporation rate from soil pre-ictable from weather data during winter conditions when the surface is moist. (*Same item as* .2–6, Feb. 1954, *MAB.*) *Subject Headings:* **1. Evaporation research 2. Evaporation theories . Evaporation from soil.**—*A.A.*

10I–4 551.573:551.551:016

†Budyko, M. I., **Isparenie v estestvennykh usloviiakh.** [Evaporation under natural conditions.] eningrad, Gidromet. Izdat., **1948.** 135 p. 26 figs., 8 tables, 235 refs., 107 eqs. **DLC**—Without lighting the importance of the contributions of Russian and especially of Soviet workers in this road field the author has, in this technical monograph, summarized and organized the results of a ast amount of native and foreign research (both theoretical and practical) on evaporation and urbulent exchange from the soil and from water surfaces. The literature cited covers the entire eriod of instrumental investigations into the laws governing evaporation, from HALLEY (1687–694), RICHMAN (1744–1751) and WILD (1874) to PRANDTL (1944) and SHEPPARD (1947) on one and, and BUDYKO (1945–1948), LAĬKHTMAN (1947), OBUKHOV (1946) and IUDIN (1940–1948) on he other. The several chapters consist of detailed treatment of: 1) equations of heat and moisture alance of the surface layers and the physiogeographical relationship of moisture and heat exchange;) progress in research along these lines to date; 3) characteristics of the lower layer of the atmosphere nd depth of this "microclimatic" layer; 4) turbulence lapse rates and convection in the ground layer;) influence of soil conditions and ground cover on evaporation; 6) methods of measuring or calculat-ng natural evaporation; 7) dependence of evaporation on meteorological elements; 8) heat and noisture balance at the ground in European U.S.S.R. and over the whole earth. The bibliography of 35 refs. contains about 110 from Russian literature; the rest from foreign sources. (*Same item as* .7–153, July 1952, *MAB.*) *Subject Headings:* **1. Evaporation 2. Turbulent exchange 3. Energy xchange 4. Evaporation bibliographies 5. History of meteorology.**—*M.R.*

10I–5 551.573

Penman, Howard Latimer, **The dependence of transpiration on weather and soil conditions.** *ournal of Soil Science,* Oxford, 1(1):74–89, March **1949.** 5 figs., 3 tables. **DA**—Author derives an xpression for evaporation from open water involving only values of meteorological elements in the reen and known constants. The seasonal ratios of transpiration from turf with abundant water to pen water evaporation are obtained empirically. When water supply is deficient, transpiration de-ends on soil moisture available in the zone occupied by roots. A composite drying curve is con-ructed from British transpiration and drainage records. It is found that times of running of eld drains can be predicted using only the available water in the root zone, which varies from year o year with the spring rainfall. (*Same item as* 4.8–163, Aug. 1953, *MAB.*) *Subject Headings:* **. Evapotranspiration 2. Soil moisture effects on transpiration 3. Weather effects on transpiration.** —*C.E.P.B.*

10I–6 551.573(438)

*†Schmuck, Adam, **O parowaniu potencjalnym.** [Potential evaporation.] *Wrocławskie To-arzystwo Naukowe, Prace, Ser. B,* No. 25, **1949.** 50 p. 15 figs., tables, 63 refs. On title-page: cta Meteorologica et Climatologica Universitatis Wratislaviensis. **DLC**—In the first part of the aper, entitled **Measurements of evaporation at Wrocław,** after having discussed the different ways f determining and methods of evaluating evaporation, the author presents the most important esults of experiments, based on evaporation measurements for 3 yrs at Wrocław at different heights), 50, 200, 530, 815 cm) and in different environments (instrument shelter, under uninclosed roof nd in open air). Results show that S.E. winds bringing dry air from the continent during the egetative period simultaneously raise the temperature and increase evaporation. The second part,

entitled **A test to determine potential evaporation in Poland,** deals with the question of the value of potential evapotranspiration in the vegetative and winter periods, its annual value and the changes of evaporation with changes of altitude. A number of tables and graphs illustrate the text. (*Same item as* 6.5–212, May 1955, *MAB.*) *Subject Headings:* **1. Evaporation measurements 2. Potential evapotranspiration 3. Wrocław, Poland.**—*A.M.P.*

1950

10I–7 551.573(485):551.579

Bergsten, Folke, **Contribution to study of evaporation in Sweden.** *Sweden. Meteorologiska och Hydrologiska Institut, Meddelanden, Ser. D,* No. 3, **1950.** 57 p. 23 figs., 3 tables, 10 refs., 3 eqs., append. (incl. 10 tables).—Earlier works by Wallen and Melin on evaporation in Sweden are reviewed and the basic principles discussed. Effect of summer temperature on evaporation and runoff studied in general and for many individual basins. Records of temperature at Stockholm since 1756 are smoothed and plotted to show recent trends in proper perspective. It was concluded that hot dry summers show little difference from cool wet ones with respect to amount of evaporation. Detailed studies on precipitation, runoff, evaporation and temperature are based on data from 1920–1945. (*Same item as* 2.3–118, March 1951, *MAB.*) *Subject Headings:* **1. Evaporation 2. Hydrologic cycle 3. Sweden.**—*M.R.*

10I–8 551.585:551.573

Curé, P., **La nouvelle classification des climats de Thornthwaite.** [Thornthwaite's new climatic classification.] *La Météorologie,* 4th Ser., No. 18:99–106, April/June **1950.** 6 refs., eqs. English and Spanish summaries p. 99. **DWB**—THORNTHWAITE's method of calculating potential evapotranspiration, the assumptions underlying his new climatic classification, the calculation of indices of aridity and humidity and the use of evapotranspiration as a measure of thermal efficiency are discussed. The author asserts that the calculations necessitated by THORNTHWAITE's formulas are too complex, that the formulas must be modified before they can be applied to the classification of climates other than those of the U. S. and that the assumption that the effectiveness of aridity is 6/10 of that of humidity may not be universally valid. It is suggested that added precision of the concept of potential evapotranspiration could be achieved by measurements of actual evapotranspiration. (*Same item as* 2.3–156, March 1951, *MAB.*) *Subject Headings:* **1. Climatic classification 2. Evapotranspiration.**—*I.L.D.*

10I–9 551.573(61):551.585

†*Dubief, J., **Évaporation et coefficients climatiques au Sahara.** [Evaporation and climatic coefficients of the Sahara.] *Algiers. Université. Institut de Recherches Sahariennes, Travaux* Vol. 6:13–44, **1950.** 2 figs., 4 charts, table, 25 refs. **DLC** (DT331.A4)—A thorough study of daily, annual and regional variations in evaporation over northwest Africa. Monthly average evaporation data are given for 41 stations in Algeria, Tripoli and French West Africa. Isolines of maximum, minimum and average annual evaporation are shown in charts for all of North Africa. Mean isolines of the coefficient D of evaporation are also presented for North Africa. (*Same item as* 2.7–134, July 1951, *MAB.*) *Subject Headings:* **1. Evaporation 2. Climatic index 3. Sahara 4. Northwest Africa.**—*M.R.*

10I–10 551.585:551.582.1:551.573(931)

†Garnier, Benjamin John, **Climates of New Zealand according to Thornthwaite's classification.** (In: Garnier, B. J. (*ed.*), **New Zealand weather and climate.** Christchurch, N. Z., Whitcomb and Tombs, **1950.** p. 84–104. graphs, tables, diagrs., 31 refs.) Also his **The seasonal climates of New Zealand.** *Ibid.,* p. 105–139. graphs, diagrs., refs. **DLM**—The first paper is a revision of an article which appeared originally in *Association of American Geographers, Annals,* 36(3):151–177, Sept. **1946.** Climatic classifications, types according to the Thornthwaite system, T-E and P-E indices, correlations with vegetation and soil, local variations in types and detailed charts of the two main islands with supporting tabular data are presented and discussed. In the second paper the author constructs charts for each of the seasons for the two islands by using two scales of (a) moisture categories (7 classes) and (b) thermal categories (5 classes). This system, which he calls a "modified Thornthwaite system," shows up the contrasts in latitude, altitude, distance from the sea, and between the two islands. Extensive discussion, nomograms for quantitative evaluation of charts and some data are presented. (*Same item as* 3.6–172, 183, June 1952, *MAB.*) *Subject Headings:* **1. Climatic classification 2. Evapotranspiration 3. Precipitation effectiveness 4. Thermal efficiency 5. Thornthwaite's classification 6. New Zealand.**—*M.R.*

10I–11 551.5

International Union of Geodesy and Geophysics. Association of Scientific Hydrology, [**Proceedings and transactions of the**] **General Assembly, Oslo, Aug. 19–28, 1948.** Issued Louvain

(1950?), 3 vol. (399, 407 and 308 p.). **DWB** (M0(6)I611g S. Hyd)—Papers delivered at this International Association of Scientific Hydrology meeting are presented in full or summary form in three volumes. The first volume (potamology and limnology) includes 13 papers (or summaries) delivered at the session on evaporation (p. 53–139), with representatives from Czechoslovakia, Great Britain, Poland, the United States, France, Canada, Italy and Finland reporting on methods of evaporation measurement and computation in their countries. Data on regional and local evaporation are included in several of these papers in tables, graphs and charts. In Vol. 2 (snow and glaciers) evaporation from snow is discussed in some of the papers on snow cover (p. 25–287). Vol. 3 (subterranean waters) contains two papers on evaporation, namely: Dey, L. J. L.: **The lysimeter station at Castricum, Holland,** p. 11–15 (for abstract, *see* 7.2–204, Feb. 1956, *MAB*) and Ramdas, L. A. (Poona, India): **Report on "Evaporation from bare soil in relation to the depth of the water table or the zone of saturation,"** p. 16–19 (*see* 6.1–236, Jan. 1955, *MAB*). *Subject Headings:* **1. Evaporation research 2. Evapotranspiration 3. Evaporation of snow 4. Evaporation measurement.**—*G.T.*

10I–12 551.579:551.573(47)

Kashin, K. I. and Pogosian, Kh. P., **O vlagooborote v atmosfere.** [On moisture exchange in the atmosphere.] *Meteorologiia i Gidrologiia*, No. 1:5–13, Sept. **1950.** 3 tables, 6 refs. **DLC**—The purpose of this study is to estimate the role of evaporation in the hydrologic cycle over small and large surfaces of the continent. The work by TSINZERLING on this problem published in 1949 contains inaccurate conclusions because of the incorrect method used in his investigations. For correct determination of the amount of moisture transported by air masses from ocean to continent it is necessary to know the amount of moisture in the atmosphere, precipitation, runoff and evaporation. The moisture content in the air should be taken in consideration up to 4–5 km elevation. The authors analyzed the observations for the U.S.S.R. and presented the following conclusions: 1) the important factor in moistening of the atmosphere is the evaporation from large surfaces, the evaporation from small areas is not effective; 2) the forest belts increase the roughness of the soil surface and therefore give some increased amount of precipitation and 3) the coefficient of moisture exchange for European U.S.S.R. presented by TSINZERLING as 2.5 is exaggerated approximately 7 times. (*Same item as* 3.5–246, May 1952, *MAB.*) *Subject Headings:* **1. Hydrologic cycle 2. Evaporation 3. Water transport 4. U.S.S.R.**—*N. T. Zikeev.*

10I–13 551.585:551.573(94)

Leeper, G. W., **Thornthwaite's climatic formula.** *Australian Institute of Agricultural Science, Melbourne, Journal*, 16(1):2–6, March **1950.** refs. **DLC**—A critical examination of THORNTHWAITE'S climatic formula is presented. For several stations in Australia it underestimates the loss of water to the atmosphere in winter; it fails to distinguish between a dry Mediterranean summer and a wet monsoonal summer and it ignores the actual humidity. More reliable evaporation figures for Australia are obtainable by a simplified form of THORNTHWAITE'S evapotranspiration formula and by the saturation deficit equation. (*Same item as* 3.4–235, April 1952, *MAB.*) *Subject Headings:* **1. Thornthwaite's classification 2. Evapotranspiration 3. Australia.**—*I.L.D.*

10I–14 551.573(71)

Sanderson, Marie, **Some Canadian developments in agricultural meteorology. Pts. 1–2.** *Weather*, Boston, 5(11,12):381–383; 409–412, Nov., Dec. **1950. DWB**—A test of THORNTHWAITE'S evapotranspiration formula is described; the meter is a tank filled with gravel and soil to ground level, connected with a water supply held constant at 2 ft below surface. Measurements at Toronto and Norman Wells on average agreed closely with formula. Applications to crop testing and irrigation described. (*Same item as* 2.2–107, Feb. 1951, *MAB.*) *Subject Headings:* **1. Potential evapotranspiration 2. Evaporation measurement 3. Canada.**—*C.E.P.B.*

1951

10I–15 551.573(73)

†*Blaney, Harry F. (*U. S. Soil Conservation Serv., Los Angeles*), **Consumptive use of water.** *American Society of Civil Engineers, Proceedings*, Vol. 77, Separate No. 91, Oct. **1951.** 8 tables, 3 figs., 32 refs. **DWB**—The subject of consumptive use for evapotranspiration is discussed with special reference to definitions, methods and results of research. Empirical formulas are analyzed relating the consumptive use to temperature, daytime hours and humidity. Total evapotranspiration data for the growing period or annual periods are given for irrigated crops and natural vegetation on the basis of field experiments, tank measurements and soil moisture studies. (*Same item as* 7.5–194, May 1956, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Irrigation 3. United States.**—*A.A.*

10I–16 551.573:551.556.2

†Budyko, M. I., **O vliianii meliorativnykh meropriiatiĭ na ispariaemost'.** [On the influence o amelioration measures upon evaporation.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geogr.*, No 1:16–35, **1951.** 8 figs., 28 refs., 7 eqs. **DWB.** Transl. into Romanian in *Analele Romano-Sovietice Seria Geologie-Geografie*, 7(10):57–79, July/Aug. **1952. DLC**—The author presents a critical analysi of existing methods of determining and utilizing values of evaporation from land and water surface for physico-geographic calculations. He recommends the application of improved methods o calculating potential evaporation and its probable change under the effect of forest shelter belts Numerous curves are presented to show the relationship between radiative heat transfer, mea temperature, turbulence, latitude, etc. and evaporation or potential evaporation. (*Same item a* 3.6–130, June 1952 and 6.3–213, March 1955, *MAB.*) *Subject Headings:* **1. Evaporation 2. Po tential evapotranspiration 3. Shelter belt effects on evaporation 4. Translations 5. Romania language.**—*A.M.P.*

10I–17 551.585(82):551.57

†Burgos, Juan Jacinto and Vidal, Arturo L., **Los climas de la República Argentina, según l nueva clasificación de Thornthwaite.** [The climates of the Argentine Republic according to Thorn thwaite's new classification.] *Meteoros*, Buenos Aires, 1(1):3–32, Jan. **1951.** 8 figs., 6 tables, 2 refs. **DWB**—THORNTHWAITE'S method of potential evapotranspiration is used to analyze th climate of Argentina, with particular reference to the relationship between vegetation and climati zones to describe the water balance and to classify the climate of Argentina. The precipitation an temperature data provided by the Argentine meteorological network have been used; actual measure ment of evapotranspiration by means of "evapotranspiration tanks" has not been carried ou Maps showing water surplus, water deficiency, moisture regions, seasonal variations of moistur efficiency, thermal regions and the summer concentration of moisture efficiency are presented. close correspondence in values for soil moisture was found between the results obtained by th THORNTHWAITE method and those obtained by actual calculations of soil moisture at several localitie in Argentina. After analyzing the various methods of climatic classification applied to classify th Argentine climate, the authors conclude that THORNTHWAITE'S method shows the best correspondenc with the vegetation zones. The article presents a complete description of method of potentia evapotranspiration and the necessary data and nomograms for making calculations. (*Same item a* 2.11–170, Nov. 1951, *MAB.*) *Subject Headings:* **1. Climatic classification 2. Potential evapo transpiration 3. Argentina.**—*I.L.D.*

10I–18 551.556.2:551.584:551.57

†D'iachenko, A. E., **Les i urozhaĭ.** [Forest and yield.] *Akademiia Nauk SSSR. Institu Lesa, Nauchnye Voprosy Polezashchitnogo Lesorazvedeniia*, No. 1:285–295, **1951.** 5 tables, biblio **DLC**—Literature review of the favorable influence of forest shelter belts on yield, improvement microclimate, retention of snow and soil moisture conditions. The transpiration coefficient decreas and the transpiration productivity increases, approaching the shelter belts. (*Same item as* 6.3–17 March 1955, *MAB.*) *Subject Headings:* **1. Shelter belt effects on transpiration 2. Microclima control 3. Crop yield 4. Transpiration.**—*A.A.*

10I–19 551.573(729.

*Fuhriman, D. K. (*Wisc. Univ., Dept. Hydraulics*) and Smith, R. M. (*Puerto Rico Agri. Ex Station*), **Conservation and consumptive use of water with sugar cane under irrigation in the sou coastal area of Puerto Rico.** *Journal of Agriculture of the University of Puerto Rico*, Rio Piedr 35(1):1–47, Jan. **1951.** 13 figs., 9 tables, 19 refs. **DWB**—Detailed data are given for soil moistu rainfall and consumptive use (evapotranspiration). Soil moisture tension curves discussed and t effective rainfall in fields evaluated. Evapotranspiration formula proposed for ample water supp $E = kTS(1 + W/200)$, where E = evapotranspiration [inches per month], T = average temperatu [°F], S = hours of sunshine per month, W = wind velocity [miles per day] and k = constant, may a function of the relative humidity. No verification. (*Same item as* 4.9–157, Sept. 1953, *MA Subject Headings:* **1. Evapotranspiration 2. Soil moisture 3. Sugar cane cultivation 4. Puerto Ri** —*A.A.*

10I–20 551.573:551.579(9

Garnier, B. J., **The application of the concept of potential evapotranspiration to moistu problems in New Zealand.** *New Zealand Geographer*, Wellington, 7(1):43–61, April **1951.** 5 fi 4 tables, refs. **DLC**—Potential evapotranspiration varies slightly from year to year (in New Zeala as temperatures vary, but such variation is less than that of precipitation so can be used as a m stable index of regional water requirements. A comprehensive analysis of data for all of N. Z. terms of evapotranspiration and moisture deficiency from region to region is suggested, and sam

omputations given in tables, graphs and on charts. Effects of altitude, distance from coast, latitude nd orography considered. Areas of slight, moderate and severe moisture deficiency are treated ndependently. (*Same item as* 3.9–178, Sept. 1952, *MAB.*) *Subject Headings:* **1. Potential evapo-ranspiration 2. Moisture deficiency 3. Thornthwaite's classification 4. New Zealand.**—*M.R.*

10I–21 551.573

Halstead, Maurice H., **Theoretical derivation of an equation for potential evapotranspiration.** In: Johns Hopkins Univ. Lab. of Climatology, Seabrook, N. J., Contract W28-D99-ac-378 (Micrometeorology of the surface layer of the atmosphere), **Interim Report,** No. 16:10–12, Dec. 31, **1951.** 9 eqs., 2 refs.) **DWB**—The author assumes a linear dependence of the coefficient of diffusion n height. At the surface itself the diffusion of water vapor is molecular, at higher levels it is tur-ulent. After a few approximations, the author derives the formula $E = -C_1L(\rho_1' - \rho_0')$, where = total evaporation; C_1 = constant; L = length of day; ρ_1 = density of water vapor in the air; $_0$ = density of water vapor at the evaporating surface. Assuming that the temperature of the vaporating surface is equal to the air temperature, that the density of water vapor has no diurnal ourse, that the air is saturated during the nocturnal temperature minimum, and that the total vaporation during the day is proportional to the evaporation during the maximum temperature, the uthor proposes the simple formula $E = C_2L(\rho' T_{max} - \rho' T_{min})$ for maximum density of saturated ater vapor at maximum and minimum temperatures. It is suggested that this formula be used or the total potential evapotranspiration. (*Same item as* 4.1–162, Jan. 1953, *MAB.*) *Subject Headings:* **1. Evaporation 2. Evapotranspiration 3. Turbulent diffusion.**—*A.A.*

10I–22 551.585

†Hare, F. Kenneth, **Climatic classification.** (In: **London Essays in Geography, Memorial Volume,** ed. by Rodwell Jones, L. Dudley Stamp and S. W. Wooldridge. Cambridge, Harvard Univ. Press, **1951.** p. 111–134. 3 figs., table, 32 refs.) **DLC**—A critical study of KÖPPEN'S (1900) and THORNTHWAITE'S (first 1931 and second 1948) classifications and of the use of the *moisture index* and thermal efficiency concepts. Most climatic classifications are devised by and used for ecology and are of little use to workers in other fields. Several attempts to improve on KÖPPEN'S system, by shifting limits, are described. The precipitation ratio concept has grown in favor since 1905 (TRANSEAU) and has been used by LANG (1920), DE MARTONNE (1927) and others besides THORN-THWAITE. The latter has presented the most refined system, but it still takes no account of the effect of human activity. (*Same item as* 2.8–141, Aug. 1951, *MAB.*) *Subject Headings:* **1. Climatic classification 2. Evapotranspiration.**—*M.R.*

10I–23 551.573

Haude, Waldemar, **Zur Bestimmung der Verdunstung mit Hilfe von im Boden eingesetzten Töpfen.** [Determination of evaporation with the help of pots set in the ground.] *Zeitschrift für Meteorologie,* 5(5/6):139–143, May/June **1951.** fig., table, 4 refs. **DWB, DLC**—In Langenhagen, glazed clay pots ½ and 1 m deep were sunk in soil with a central gage. They were filled with soil or sand, and bare or grass-covered. Evaporation-precipitation was measured by fluctuations of water level or by water added or abstracted to keep level fixed. Runoff of a nearby stream was also measured. Figure shows results April–Oct. 1950. (*Same item as* 2.11–130, Nov. 1951, *MAB.*) *Subject Headings:* **1. Evaporation measurement 2. Runoff.**—*C.E.P.B.*

10I–24 551.579(47)

Ioganson, V. E., **O gidrologicheskom raïonirovanii SSSR.** [Hydrological classification of the U.S.S.R.] *Voprosy Geografii,* Moscow, No. 26:73–79, **1951.** 2 figs., refs. **DLC** (G23.V6)—Author presents a literature survey of methods used for dividing the Soviet Union into hydrologic regions and proposes to use for this purpose the ratio r = evapotranspiration/runoff. Maps of r with forest zones presented for the European part. $r < 1$ = runoff zone; $1 < r < 3$ = intermediate zone; > 3 = evaporation zone. Isoline $r = 1$ lies on 60°N; $r = 3$ on 53°N (roughly coincides with the southern limit of forests). Further sub-regions are established on the basis of the seasonal distribution of runoff. (*Same item as* 5.3–268, March 1954, *MAB.*) *Subject Headings:* **1. Hydrologic regions 2. Evapotranspiration 3. U.S.S.R.**—*A.A.*

10I–25 551.573:581.11

*Ivanov, L. A.; Silina, A. A.; Zhmur, D. G. and Tsel'niker, Iu. L., **Ob opredelenii transpiratsion-nogo raskhoda drevostoem lesa.** [Determination of transpiration by a forest stand.] *Botanicheskiĭ Zhurnal,* Moscow, 36(1):5–20, **1951.** 11 tables, refs. **DLC**—Method of quick weighing of tree leaves tested and applied for a region near Moscow. Transpiration intensity of 17 tree species was determined in more than 6000 cases. Statistical tabulation of observational materials shows that during the growing season good relation exists between the air temperature and the transpiration intensity. Correlation coefficients were 0.65–0.95. Transpiration rates at sufficient moisture supply

are presented for each species, arranged by temperatures from 4° to 29°C. (*Same item as* 7.4–222 April 1956, *MAB.*) *Subject Heading:* **1. Transpiration of forests.**—*N. T. Zikeev.*

10I–26 551.573:551.588.(

†Ivanov, L. A., **Otnoshenie k vlage drevesnykh porod, primeniaemykh pri stepnom lesorazvedenii** [Relationship of trees used in afforestation of steppes to moisture.] *Akademiia Nauk SSSR Institut Lesa, Nauchnye Voprosy Polezashchitnogo Lesorazvedeniia*, No. 1:109–124, **1951.** 5 tables bibliog. p. 123–124. **DLC**—Literature review for the years 1890–1940 on transpiration of a grea many kinds of trees and shrubs, listing 25 Russian papers and but one obsolete foreign source Some of these papers deal with the influence of meteorological conditions and soil moisture on tran spiration. (*Same item as* 7.4–223, April 1956, *MAB.*) *Subject Headings:* **1. Transpiration 2. Soi moisture 3. Forest influences on transpiration.**—*A.A.*

10I–27 551.579(43

†*Keller, Reiner (*Geogr. Inst., Univ. Bonn*), **Natur und Wirtschaft im Wasserhaushalt der rhei nischen Landschaften und Flussgebiete.** [Nature and economy in relation to the hydrology of th Rhine region and drainage basin.] *Forschungen zur Deutschen Landeskunde*, Remagen, v. 57, **1951** 158 p. tables (some fold.), eqs., bibliog. p. 142–158. Also issued as *Bonn. Universität. Geo graphisches Institut, Arbeiten, Ser. A*, No. 20. **DWB**—An unorthodox approach to the problem o the water balance in one of the most industrialized areas of Europe. The study covers West Germany from 49°45′N to 52°40′N and up to 8°20′E. Maps given for annual and summer areal precipitation drainage basins and annual water use (W) of different crops, which was computed by the formula

$$lg\ W = a + \frac{(lg\ F)^{\text{II}}}{1 + lg\ F}\ \text{[mm]};\ F = \text{green mass in gr m}^{-2},\ a = \text{constant which depends on climatic condi}$$

tions. Furthermore, detailed tables are given for precipitation and population in catchment areas as well as the annual component of the water balance for selected areas in comparison to compute values, and the water use of industrial undertakings. Water use per capita depends on area c catchment. (*Same item as* 5.9–252, Sept. 1954, *MAB.*) *Subject Headings:* **1. Hydrologic cycl 2. Evapotranspiration 3. Hydrologic charts 4. Northwest Germany.**—*A.A.*

10I–28 551.579:551.573(54

Khosla, A. N. (*Irrigation and Navigation Commission, New Delhi*), **Appraisal of water resources analysis and utilization of data.** (In: United Nations Scientific Conference on the Conservation an Utilization of Resources, Lake Success, N. Y. 1949, **Proceedings, v. 4, Water Resources,** p. 64–7 **1951.** 6 figs., 7 tables, 8 refs.) **DWB**—The author proposes what he believes to be a "universa formula" for the monthly evapotranspiration loss (L_m) in inches $L_m = (T_m - 32/9.5)$, where T_m is th monthly mean temperature in °F. For $T_m < 40$°F he gives the provisional values:

T_m	40°	30°	20°	10°	0°	F
L_m	.84	.70	.60	.50	.40	in.

The annual loss is $L_a = aT_a$, where a is a constant for a given catchment area, which varies from. 4 to .57 for 19 cases examined (almost all in the U. S.). The important studies of THORNTHWAIT and of WUNDT on this subject are not even mentioned. The author applies his formula for a com prehensive calculation of runoff for the greater rivers in India and for the whole country. Th average calculated runoff for India is 17.8″ compared with 41.0″ rainfall. (*Same item as* 4.3–23 March 1953, *MAB.*) *Subject Headings:* **1. Hydrologic cycle 2. Evapotranspiration 3. Runo 4. India.**—*A.A.*

10I–29 551.573:551.5

Möller, Fritz, **Bestimmung der Landesverdunstung durch Grossaustausch. (Vorläufi Mitteilung.)** [Determination of the regional evaporation by large scale horizontal exchange: pr liminary report.] *Annalen der Meteorologie*, 4(1/6):157–160, **1951.** table, 10 refs., 4 eqs. **DWB** Author develops a differential equation for evaporation minus precipitation over a month or mo in terms of change of water vapor and mean wind vector. These terms are calculated for a regi including England, Holland, North Sea and Northwest Germany for June–Sept. 1949 and Jan March 1950. Results in summer (but not winter) agree with evaporation in upper Weser valle (*Same item as* 3.4–180, April 1952, *MAB.*) *Subject Heading:* **1. Evaporation.**—*C.E.P.B.*

10I–30 551.579:551.588.6(4

†*Molchanov, A. A., **Les i vlaga.** [Forest and moisture.] *Akademiia Nauk SSSR, Institut Le Nauchnye Voprosy Polezashchitnogo Lesorazvedeniia*, 1:83–108, **1951.** 3 figs., 8 tables, refs., biblio p. 106–108. **DLC**—A detailed literature review on the influence of forests on the hydrologic cy

covering 61 Russian, but only 10 foreign, sources. Author takes up the general water balance of the earth and the influence of forests on precipitation, presents his own data on interception ("condensation" according to the author), discusses the relation between transpiration and green mass or total production of the vegetation and gives annual transpiration amounts for forests. The last chapter deals with the influence of forest shelter belts on snow cover, snow retention and soil moisture. (*Same item as* 5.2–232, Feb. 1954, *MAB.*) *Subject Headings:* **1. Forest influences 2. Hydrologic cycle 3. Evapotranspiration 4. Microclimates 5. Soil moisture 6. U.S.S.R.**—*A.A.*

10I–31 551.573 551.551:551.571

Osborn, R. R., **Computing evaporation using turbulent transport equations.** (In: Johns Hopkins University. Laboratory of Climatology, Seabrook, N. J., Contract W28-099-ac-378 (Micrometeorology of the surface layer of the atmosphere), **Interim Report,** No. 16:7–9, Dec. 31, **1951.** 2 refs., eqs.) **DWB**—The author uses the turbulent transport equation developed by HALSTEAD (*see* 4B–259, Feb. 1953, *MAB*). For the solution of this equation the absolute humidity of the air must be known at the evaporating surface and at two additional levels. The results obtained from the measured moisture profiles are checked by independent methods. Good agreement was found. (*Same item as* 4B–277, Feb. 1953, *MAB.*) *Subject Headings:* **1. Evaporation calculation 2. Turbulent transfer of moisture.**—*A.A.*

10I–32 551.573:581.11

Penman, Howard Latimer and Schofield, R. K., **Some physical aspects of assimilation and transpiration.** *Society for Experimental Biology (of Great Britain), Symposia,* No. 5 (Carbon Dioxide Fixation and Photosynthesis), held July 1950. Pub. **1951.** p. 115–129. table, 11 refs., eqs. **DLC** (QH302.S622)—A discussion of diffusion through leaf stomata leads to a theoretical ratio of transpiration from a crop to evaporation from open water, taking account of length of day. The calculated results are of the same order of magnitude as the observed ratios in a field of Rothamsted. Similar calculations for respiration of CO_2 showed however that assimilation rates are only a small fraction of what they could be. This is attributed to the building up of relatively high CO_2 concentrations inside the leaf. (*Same item as* 4.6–159, June 1953, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Plant respiration.**—*C.E.P.B.*

10I–33 551.573

Priestley, C. H. B., **Meteorological aspects of soil and crop evaporation.** (In: Specialist Conference on Plant and Animal Nutrition in Relation to Soil and Climatic Factors, Australia, **1949, Proceedings.** Pub. **1951.** p. 35–42. refs.) **DWB**—Evaporation measurements are applicable to studies of the role of evaporation in plant-weather relationships and for establishing a climatic index for representing the suitability of an area for a particular crop. The mechanism of evaporation is described as depending upon the characteristics of eddy motion. The distinction between the hydrolapse (decrease of specific humidity with height above the ground) and saturation deficit lies in the fact that the former can be both positive and negative while the latter implies unidirectional transfer of water vapor. The use of hydrolapse for plant-weather studies is stressed. Tank evaporation data can be used to "assess the evaporating power of the air" by means of general formula $E_r = cxs \cdot dxf(U)$ (c = constant depending upon nature of vegetation, U = wind velocity). The use of principles of energy balance in tank evaporation measurements and the application of the inferential aerodynamic method based on vertical wind and humidity profiles, and of soil measurements based on humidity profiles in depth and measurement of increased flux of vapor made in the air close to the surface, to measure evaporation are discussed. (*Same item as* 5.4–176, April 1954, *MAB.*) *Subject Headings:* **1. Hydrolapse 2. Evaporation measurement 3. Evaporation from soil 4. Evaporative energy.**—*I.L.D.*

10I–34 551.584:551.524.4:551.558.1

Skvortsov, A. A., **O teplovoĭ konvektsii i obmene v prizemnom sloe atmosfery.** [Heat convection and exchange in the surface layer of the atmosphere.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 6:60–80, Nov./Dec. **1951.** 6 figs., 9 tables, 4 eqs., 4 refs. **DLC**—The convective heat exchange on heated surfaces was investigated experimentally by measuring with thermocouples the continuous oscillations in air temperature in the lowest four meters of the atmosphere adjacent to the ground. Differences in duration of oscillations and of amplitudes of temperature at various levels confirm a previously established hypothesis that convective heat exchange proceeds by the formation of convective layers formed by ascending and descending air currents which die out in the course of transfer of heat from the ascending air and from mass of heated air to cooler descending currents and which are reformed by the periodic destruction and re-establishment of layers. The existence of three such convective layers is established and their properties are described qualitatively. This hypothesis is used to explain the behavior of smoke screens. The theory of convective heat exchange by means of convective layers is found to agree with the theory of local turbulence of

KOLMOGOROV. A new method of calculating evaporation from natural surfaces is developed. (*Same item as* 3.7–184, July 1952, *MAB.*) *Subject Headings:* **1. Convective heat exchange 2. Turbulent exchange 3. Convection 4. Evaporation.**—*I.L.D.*

10I–35 551.573

Thornthwaite, Charles Warren and Mather, John R., **The role of evapotranspiration in climate.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B,* 3:16–39, **1951.** 6 figs., 3 tables, 20 refs. German and French summaries p. 16–19. **DWB**—Authors distinguish between actual evapotranspiration, limited by moisture available in soil, and potential evapotranspiration. The latter is measured by sunk tanks filled with soil and planted, in which a fixed water table is maintained; 13 are in use. Setup at Seabrook, N. J., is described and vapor profiles above tanks shown. It can also be calculated from climatic data by an empirical formula and examples of annual variation in Europe compared with rainfall are shown. Detailed balance sheets are given for Zurich and Athens, showing "moisture ratio" expressed as (precipitation/evapotranspiration) −1. (*Same item as* 3.2–133, Feb. 1952, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Evaporation measurement 3. Climatic classification.**—*C.E.P.B.*

10I–36 551.579

Turc, Lucien, **Nouvelle formule pour le calcul du bilan de l'eau en fonction des valeurs moyennes annuelles des précipitations et de la température.** [New formula for calculating water balance as a function of mean annual values of precipitation and temperature.] *Académie des Sciences, Paris, Comptes Rendus,* 233(11):633–635, **1951.** 4 eqs., 4 refs. **DLC**—The actual annual evapotranspiration (E) can be computed with good results (errors in 57% of 231 catchment areas, distributed all over the world, are less than 10%) by the formula $E = P\,[0.9 + (P/L)^2]^{-\frac{1}{2}}$; P = annual precipitation; $L = 300 + 25t + 0.05t^3$ is the annual potential evapotranspiration (t = average annual temperature in °C). (*Same item as* 5.9–258, Sept. 1954, *MAB.*) *Subject Headings:* **1. Hydrologic cycle 2. Evapotranspiration.**—*A.A.*

1952

10I–37 551.573:551.579.5:631.4

Alpat'ev, A. M., **Isparіaemost' kak priblizhennyĭ pokazatel' potrebnosti sel'skokhziaĭstvennykh kul'tur v vode.** [Evaporability as an approximate indicator of water requirements by growing crops.] *Meteorologiia i Gidrologiia,* No. 5:41–47, **1952.** 7 tables, 14 refs. **DLC**—Report on experiments made in many points of the U.S.S.R. during recent years. Field investigations of relation between productivity and optimal moisture of soil showed the lowest boundary of optimal soil moisture for clayey soil about 70–80%; for sandy loam soil 50%, and still lower for sandy soils. The stable relationship between evaporation (determined as transpiration and soil evaporation) and evaporability for annual plants in various climatic regions is 0.80–0.97. That indicates the climatic ability to limit the water consumption by plants. The different condition of plants cannot noticeably change the water consumption. Many other experiments, made in arid and humid regions, indicate a good possibility of determining the water requirement by calculation of evaporability from usual climatic data. (*Same item as* 4.11–197, Nov. 1953, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Agricultural meteorology 3. Soil moisture.**—*N. T. Zikeev.*

10I–38 551.573:551.579

American Geophysical Union. Committee on Evaporation and Transpiration, **Report of the Committee, 1950–1951.** *American Geophysical Union, Transactions,* 33(1):119–122, Feb. **1952.** 8 refs. **DWB**—Short statements summarize work of members and collaborators: 1) H. W. ANDERSON's and T. G. STOREY's investigations on effect of forest cover and land use on evaporation and transpiration; 2) HARRY F. BLANEY's formula to determine evapotranspiration by climatic data; 3) E. G. DUNFORD's report on soil moisture under different conditions; 4) R. W. GERDEL's intensive study of influence of micrometeorological phenomena on snow metamorphisms, particularly ablation; 5) JOHN R. MATHER's tests on THORNTHWAITE'S evapotranspiration formula and evapotranspirometer. (*Same item as* 3.9–177, Sept. 1952, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Runoff 3. Soil moisture 4. Ablation. I. Croft, A. R. II. Blaney, Harry F. III Dunford, E. G. IV. Anderson, H. W. V. Gerdel, R. W. VI. Mather, John R. VII. Storey, T. G.**—*A.A.*

10I–39 551.573:631.4

†Burov, D. I., **Isparenie vody paruiushcheĭ pochvoĭ i pochvoĭ pod rastitel'nym pokrovom v usloviiakh Zavolzhia.** [Evaporation of water from fallow and from soil under plant cover in Zavolzhye.] *Pochvovedenie,* No. 1:41–52, **1952.** 2 figs., 6 tables, 27 refs. **DLC**—A description of various experiments on the influence of plants and of soil structure on evaporation from the soil. Evaporation increases significantly with coarse soil structure (free air circulation) and also with fine

soil structure (capillary movement of water). For bare soil the influence of soil structure is characterized by the following numbers:

Dimensions of the soil pieces (mm)	.5	.5–3	3–10	10–50
Evaporation of percentage of optimum	150	100	140	240

Plants decrease the evaporation from the soil 1.5–2 times and reduce also the influence of soil structure. (*Same item as* 4.1–161, Jan. 1953, *MAB.*) *Subject Headings:* **1. Vegetation influences on evaporation 2. Evaporation 3. Soils 4. Zavolzhye, U.S.S.R.**—*A.A.*

10I–40 551.573:581.11

Hesse, Walter, **Meteorologische Einflüsse bei der Pflanzentranspiration.** [Meteorological influences in plant transpiration.] *Annalen der Meteorologie*, 5(7/12):194–201, **1952.** 7 figs., 2 tables, 20 refs. English summary p. 194. **DWB**—Using a new type of small lysimeter, the transpiration of summer wheat and millet was observed on the same plants throughout the growing period of 1950. Other weather data were obtained on the same site. Results shown graphically include diurnal variations on 2 days and day to day variations in June and July. (*Same item as* 6.4–175, April 1954, *MAB.*) *Subject Heading:* **1. Evapotranspiration.**—*C.E.P.B.*

10I–41 551.573:551.579(481)

Høiland, Einar; Palm, E. and Riis, E., **A calculation of the evaporation at different places in South-Norway.** *Geofysiske Publikasjoner*, Oslo, 18(2), **1952.** 11 p. 6 figs., 5 tables. **DLC**—One of the first attempts to compute the annual water budget of some places in Norway, based on precipitation (P) and runoff (R) records from 5 catchment areas (200–700 km²) for 19–22 single hydrologic years. P was computed as the average of 3–5 stations, not reduced to the mean height of the area. The authors adopt the relation $R = aP - b$ for each area, assume that b is the "evaporation" and obtain values from 150 to 390 mm. The mean apparent water losses computed as the difference between mean P and R, according to given data, vary between +260 and −350 mm. The coefficient a, computed by the authors on the basis of a geometric mean between two regression lines, was found to lie between 1.09 and 1.56. (*Same item as* 5.2–188, Feb. 1954, *MAB.*) *Subject Headings:* **1. Hydrologic cycle 2. Evapotranspiration 3. Norway.**—*A.A.*

10I–42 551.573

International Union of Geodesy and Geophysics. Association of Scientific Hydrology, [**Proceedings and transactions of the**] **General Assembly, Brussels, 1951.** Issued Louvain, (**1952**). 4 vol. (358, 302, 520 and 200 p.). **DWB** (M(06) I611g S. Hyd.)—Vol. 1 contains an article on evaporation from snow: de Quervain, M. and Zingg, Th., **Über die Verdunstung der alpinen Schneedecke** [Evaporation of Alpine snow cover], p. 154–160, in which a formula for snow evaporation is developed in terms of saturation deficit, temperature, pressure and wind speed, and data on measured snow evaporation in the sun and shade are presented, showing close agreement with formula. Thirteen papers (in some cases summaries only) are grouped together in Vol. 3 (p. 403–483). In most of these, the methodological aspects of direct or indirect determination of evaporation are emphasized, as well as comparison of results of various methods with measurements in different countries. The titles of the papers are as follows:

Volker, A.: **Evaporation du lac Ijssel** [Evaporation of Lake Ijssel], p. 406–408. (For abstract, *see* 7.8–190, Aug. 1956, *MAB.*)

Langbein, W. B.: **Research on evaporation from lakes and reservoirs,** p. 409–425. A review article with 19 references. (*See* 5.9–214, Sept. 1954, *MAB.*)

Grundy, F.: **Some notes on evaporation from water and land surfaces,** p. 426–433. (*See* 6.3–222, March 1955, *MAB.*)

Penman, H. L.: **The water balance of catchment areas,** p. 434–442. (*See* 8.9–269, Sept. 1957, *MAB.*)

Bergsten, F.: **Contribution to study of evaporation in Sweden,** p. 443–451. (*See* 5.6–193, June 1954, *MAB.*)

Ostromecki, J. (Poland): **Evaporation from the surface of meadows on deep loams,** p. 452–462. (*See* 10H–28, Bibliography on Evaporation Measurement.)

Lyshede, J. M. (Denmark): **Evapotranspiration from areas in North Seeland,** p. 463–467. (*See* 5.11–168, Nov. 1954, *MAB.*)

Soegnen, R. (Norway): **Indirect computation of real precipitation and evaporation,** p 468–472. (*See* 5.11–170, Nov. 1954, *MAB.*)

Renqvist, H. (Finland): **Evaporation recorder,** p. 473. (*See* 10H–29, **Bibliography on Evaporation Measurement.**)

Sanderson, Marie: **The measurement of evaporation in Canada,** p. 474–479. (*See* 6.2–237, Feb. 1955, *MAB.*)

Bossolasco, M.: **Sur l'évaporation à la surface de la mer** [Evaporation at the sea surface] and **Sur l'hydrologie du foehn** [Hydrology of föhn], summaries only.

Moller, F. (Germany): **The determination of evaporation from large areas by the horizontal advection in the free atmosphere,** p. 482–483. Also published (in German) in *Germany. Deutscher Wetterdienst in der US-Zone, Berichte,* No. 35:172–173, **1952.** (*See* 3.10–211 and 5.8–184, Oct. 1952 and Aug. 1954, *MAB.*)

An article touching upon evapotranspiration is also contained in Vol. 4, namely: Bolelli, E., **Coefficients d'infiltration, coefficients d'évaporation; étude d'un cas précis dans des calcaires grèseux** [Coefficients of infiltration and evaporation; study of a specific case on sandy limestone], p. 12–14. Study made for the 40 km² catchment area of the oasis Ain Reboula near Rabat shows that 83.5% of the annual precipitation (549 mm) is lost by evapotranspiration. The area has 20% forests, 45% pastures and 35% cultivated land, mainly under cereals. *Subject Headings:* **1. Evaporation 2. Evapotranspiration 3. Hydrologic cycle 4. I.U.G.G. meeting, Brussels, 1951.**—*G.T., A.A.*

10I–43 551.573:581.11(584.6)

Ivanov, L. A.; Silina, A. A. and Tsel'niker, Iu. L., **O transpiratsii polezashchitnykh porod v usloviiakh Derkul'skoĭ stepi.** [Transpiration of wind shelter plants under conditions of the Derkul' Steppe.] *Botanicheskiĭ Zhurnal,* Moscow, 37(2):113–127, **1952.** fig., 8 tables, refs. **DLC**—Transpiration rates of different kinds of trees are given for a region of ample moisture supply (near Moscow) and the Derkul' Steppe. Temperature, solar radiation and saturation deficit are higher in the steppe, but the transpiration nevertheless lower. Correlation with temperature is high at sufficient moisture supply (up to 0.98) and low or even negative in the steppe. No relation to wind speed. (*Same item as* 7.1–270, Jan. 1956, *MAB.*) *Subject Headings:* **1. Transpiration of trees 2. Moscow Region, U.S.S.R. 3. Derkul' Steppe, Kazakhstan.**—*A.A.*

10I–44 551.579:551.573

Khosla, A. N. (*Chairman, Indian Central Water and Power Commission*), **Inter-relation of surface and ground water with special reference to arid zones.** *Irrigation and Power,* Simla, 9(3):402–411, July **1952.** 3 figs., refs. **DWB**—The author applied his newly developed formula for evapotranspiration losses from catchment areas, based on monthly temperatures (*see item* 10I–28 above) to the Kantli River, a typical desert stream with ground water tables sloping away from the river. Evapotranspiration computed for one year from rainfall, runoff and ground water storage after the monsoon season, was in good agreement with results computed by the author's formula. (*Same item as* 5.9–253, Sept. 1954, *MAB.*) *Subject Headings:* **1. Hydrologic cycle 2. Evapotranspiration 3. Kantli River 4. Rajasthan Desert, India.**—*A.A.*

10I–45 551.571.1(438)

Kosiba, Aleksander, **Zagadnienie bilansu wilgoci na Slasku w swietle zmian wilgotnosci wzglednej.** [The problem of moisture balance in Silesia according to variations of relative humidity.] *Przegląd Meteorologiczny i Hydrologiczny,* Warsaw, 5(3/4):58–70, **1952.** 2 figs. English summary p. 68–69. **DWB**—The moisture resources in Silesia show great changes in recent years. Taking into account Wrocław evaporation data for 1946–1950 one finds a negative moisture balance in agreement with negative anomalies of relative humidity and precipitation. The study of the polar front and of the wind frequencies during the period points to an expansion of subtropical air masses towards the north and to an animated planetary circulation. This feature favors the activity of orographic föhns followed by a decrease of relative humidity, rainfall and by an increased evaporation. These phenomena affect not only the foothills of the Sudetes but are felt as far as the lowlands of western Poland where a moisture deficiency is also being observed. (*Same item as* 6.1–229, Jan. 1955, *MAB.*) *Subject Headings:* **1. Moisture balance 2. Humidity variations 3. Precipitation variations 4. Silesia, Poland.**—*Author's abstract.*

10I–46 551.579.5:551.573:551.588.7

†Kramer, Paul J. (*Duke Univ., Durham, N. C.*), **Plant and soil water relations on the watershed.** *Journal of Forestry,* Wash., D. C., 50(2):92–95, Feb., **1952.** 24 refs. **DLC**—A concise review of soil-water relationships, vegetation in relation to water storage, factors affecting transpiration and total water loss. Valuable references are given. (*Same item as* 4.4–221, April 1953, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Soil moisture 3. Forest influences on water regime.**—*A.A.*

10I–47 551.573:581.1

Markkink, G. F., **Betrekkingen tussen cultuurgewassen en bodemvocht.** [Relations between crops and soil moisture.] (In: Nederlandse Centrale Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek. Commissie voor Hydrologisch Onderzoek, **Verslagen Technische Bijeen**

komsten, 1–6, 1946–1950. Pub. **1952.** p. 185–201. 13 figs., table. In Dutch; English, Esperanto and French summaries p. 294–295, 323–324.) **DWB**—Author discusses relations between relative moisture, suction force, *pF* values and the water transport to the plant and presents a valuable review (with graphical data) of previous investigations on the relation between the water-consumption and the dry matter production of different crops, giving author and year of publication, but not a single reference. (*Same item as* 5.1–257, Jan. 1954, *MAB.*) *Subject Headings:* **1. Transpiration 2. Agricultural meteorology 3. Soil moisture.**—*A.A.*

10I–48 551.579:551.573

†Meigs, Peveril, **Water problems in the United States.** *Geographical Review*, 42(3):346–366, July **1952.** 9 figs., 48 refs. **DWB**—The problem of water supply and usage in the U. S. is examined from a broad perspective and in detail with respect to the several factors involved (precipitation, evapotranspiration, surface runoff and ground water on the one hand, and irrigation, industrial, hydroelectric and other uses on the other hand). Precipitation records from 1850 to 1950 for New York City, Pierre, S. Dak., and San Diego, Calif., are shown to illustrate complicated variations in annual precipitation. The author discounts any "trend" as depending on just when one starts reckoning. However, the increasing temperature in the past 40 years may affect evapotranspiration and hence decrease water supply if continued. Recent droughts in the Southwest and New York, and attempts at rain making to relieve drought are cited. Charts showing precipitation, evapotranspiration, runoff and erosion in the Missouri Basin are presented. (*Same item as* 4.7–167, July 1953, *MAB.*) *Subject Headings:* **1. Hydrologic cycle 2. Drought 3. Potential evapotranspiration 4. Long period records 5. Missouri Basin 6. United States.**—*M.R.*

10I–49 551.573(84) 551.577.2(84)

Morales N., Hector, **Evaporación.** [Evaporation.] *Nimbus*, La Paz, 3(8/9):6–16, Jan./June **1952.** fig., 3 refs. **DLC**—After a general discussion of problems involved in computing evaporation, the author analyzes the evaporation regime of the high plateau corresponding roughly to the territory of the Department of Oruro (52,800 sq km). This is the coldest region of Bolivia, with temperatures sometimes as low as −23°C. The area extends to an altitude of 3700 m. It includes the lakes Poopó and Coipasa and the Desaguadero River with its tributaries. Five-year annual mean precipitation values are presented for various parts of the region. Evaporation from Lake Poopó is estimated. (*Same item as* 4.8–162, Aug. 1953, *MAB.*) *Subject Headings:* **1. Evaporation 2. Precipitation amount 3. Bolivia.**—*G.T.*

10I–50 551.579(689)

***Natural water and its use in S. Rhodesia, Pt. 1, The hydrologic cycle.** *Rhodesia Agricultural Journal*, Salisbury, 49(4):203–211, July/Aug. **1952. Pt. 2, Water in the atmosphere.** *Ibid.*, 49(5):272–279, Sept./Oct. **1952. Pt. 3, Water and the soil.** *Ibid.*, 49(6):384–391, Nov./Dec. **1952. Pt. 4, Runoff and summer streamflow.** *Ibid.*, 50(1):54–67, Jan./Feb. **1953. Pt. 5, Use of water by vegetation.** *Ibid.*, 50(3):255–262, July/Aug. **1953. Pt. 6, Underground water and its use in southern Rhodesia.** *Ibid.*, 50(6):486–490, Nov./Dec. **1953. Pt. 7, Conservation aspects.** *Ibid.*, 51(3):193–196, May/June **1954. Pt. 8, General review and suggestions for research.** *Ibid.*, 51(6):478–488, Nov./Dec. **1954.** tables and figs. throughout the 8 articles. All are reprinted also as *Southern Rhodesia. Minister of Agriculture and Lands* [*Meteorological Dept.?*], *Bulletin*, No. 1661, 1682, 1695, 1703, 1722, 1747, 1770 and 1795.—A general discussion in popular form, urging the need for intensified research in hydrology in order to achieve a better utilization of available water supply. It is a useful introduction to the numerous aspects of the hydrologic cycle. The scientist will be interested in the approximate distribution of rainfall into evaporation, runoff, etc. for Rhodesia (Pt. 1 and 8), characteristic soil moisture constants (Pt. 3), available annual data for rainfall and runoff for 4 catchments and pan evaporation (Pt. 4), as well as ground water table related to rainfall (Pt. 4). (*Same item as* 8.6–315, June 1957, *MAB.*) *Subject Headings:* **1. Hydrologic cycle 2. Transpiration 3. Runoff 4. Southern Rhodesia.**—*A.A.*

10I–51 551.573

Penman, H. L., **The physical basis of irrigation control.** *International Horticultural Congress, 13th, 1952, Report.* [Reprint of 12 p.] fig., 4 tables, 14 refs., eqs. **DA**—The physical principles of evaporation (energy supply, saturation deficit) are set out for open water in a series of equations involving other weather data. Transpiration from crops is more difficult to calculate but can be related to evaporation from water by a conversion factor E_T/E_0. This is analyzed theoretically for short crops and orchards. Calculated transpiration from an orchard with clover ground cover at Tatura, Victoria, agrees with estimated values. An appendix lists symbols and basic formulas. (*Same item as* 6.2–235, Feb. 1955, *MAB.*) *Subject Headings:* **1. Evaporation theories 2. Evapotranspiration.**—*C.E.P.B.*

10I–52 551.573:581.11:631.6

Penman, H. L., **Water and plant growth.** *Agricultural Progress*, London, 27(2), **1952.** 8 p. 12 refs. **DA**—Transpiration is regarded as merely passage of water between soil and atmosphere. It is controlled by amount of solar energy retained at or near earth's surface and heat and vapor transport in the air, i.e., by the prevailing weather, when sufficient water is available in the root zone. This potential transpiration is the same for all short crops of the same color and covering the ground. Some applications to agriculture and irrigation practice are suggested. (*Same item as* 6.1–234, Jan. 1955, *MAB.*) *Subject Heading:* **1. Evapotranspiration.**—*C.E.P.B.*

10I–53 551.573:631.67(584.6) 551.551:551.571

*Preobrazhenskiĭ, T. N., **Velichina summarnogo vodopotrebleniia kul'turami pri oroshenii v iuzhnykh nekhlopkovykh raĭonakh Kazakhstana.** [Total amount of water consumption of crops in the irrigated non-cotton regions of southern Kazakhstan.] *Moscow. Vsesoiuznyĭ Nauchno-Issledovatel'skiĭ Institut Gidrotekhniki i Melioratsii, Trudy*, 26/27:125–136, **1952.** 6 tables. Also: Wegner, Maximilian, **Eine neue Methode der Bestimmung der Verdunstungshöhe auf Rieselfeldern und bewässerten Kulturen.** [A new method of estimating the evapotranspiration of crops from irrigated fields.] *Wasserwirtschaft-Wassertechnik*, Berlin, 2(11):378–379, Nov. **1952.** 2 tables, eqs. **DLC**—Study of the total transpiration of wheat, sugar beet and lucerne, depending on solar radiation and psychrometric difference at average, reduced, and maximum water supply for different yields. Some data are also given for the influence of wind speed as well as of the ground water level for different kinds of soils. WEGNER summarizes, but not with complete accuracy, the paper of PREOBRAZHENSKIĬ. (*Same item as* 6.4–255, April 1955, *MAB.*) *Subject Headings:* **1. Transpiration 2. Agricultural climatology 3. Irrigation 4. Turbulent transfer of moisture 5. Kazakh S.S.R.**—*A.A.*

10I–54 551.573:551.577(432)

†Rassow, Lothar, **Der effektive Niederschlag in Mitteldeutschland.** [The effective rainfall in Central Germany.] *Angewandte Meteorologie*, 1(4):106–114, Jan. **1952.** 7 figs., 26 refs. **DWB**—Compares various methods for measuring evapotranspiration and adopts formula of LAATSCH (1944) as best, using grass-covered sand as standard. Charts of effective rainfall (rainfall minus evaporation) are constructed for year, April–June and June–Aug., and discussed. Feather grass (*Stipa capillata*) occurs as a steppe relict nearly coinciding with excess evaporation in April–June. (*Same item as* 3.9–179, Sept. 1952, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Effective rainfall 3. Central Germany.**—*C.E.P.B.*

10I–55 551.57

*†Reichel, Eberhard, **Der Stand des Verdunstungsproblems.** [State of the evaporation problem. *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 35:155–172, **1952.** 2 tables, 11 refs. **DWB**—A comprehensive summary of the problems and results of evaporation measurement and estimation over land and sea. For land, rainfall is known and a new determination of runoff is made, the difference is annual evaporation; direct measurement by lysimeter and calculation from heat or radiation balance may give monthly values. At sea evaporation can be measured more accurately than precipitation, but direct measurements on ships are uncertain; heat balance may give better results. Much material is considered and a table summarizes results for land areas and Atlantic. A long discussion followed. (*Same item as* 3.10–213, Oct. 1952, *MAB.*) *Subject Heading* **1. Evaporation data.**—*C.E.P.B.*

10I–56 551.573:551.57

Reichel, Eberhard, **Die Verdunstung im Wasserkreislauf der Erde.** [Evaporation in the hydrologic cycle of the earth.] *Umschau*, Frankfurt a.M., 52(2):37–39, Jan. 15, **1952.** 4 figs. **DGS**—For land the mean annual rainfall =670 mm, runoff 200 mm, evaporation therefore 470 mm. Various methods of finding evaporation over land and sea are summarized; that over sea calculated as 955 mm/year. Zonal rainfall, evaporation and difference over land, sea and world as a whole shown graphically and discussed. (*Same item as* 3.4–181, April 1952, *MAB.*) *Subject Headings:* **1. Evaporation data 2. Hydrologic cycle.**—*C.E.P.B.*

10I–57 551.573:631.6:633.

Salakhov, F. S. and Korobkin, S. F., **Oroshenie khlopchatnika dozhdevaniem v zapadnykh raĭonakh Azerbaĭdzhanskoĭ SSR.** [Irrigation of cotton plants by sprinkling in the western region of Azerbaidzhan SSR.] *Gidrotekhnika i Melioratsiia*, Moscow, No. 4:12–19, **1952.** 3 figs., 5 tables. **DLC**—Transpiration of cotton studied in relation to saturation deficit, green mass and method of irrigation. Sprinkling is far more economical and favorable than other irrigation methods. (*Same item as* 5.1–215, Jan. 1954, *MAB.*) *Subject Headings:* **1. Transpiration 2. Sprinkling 3. Irrigation 4. Cotton 5. Azerbaidzhan S.S.R.**—*A.A.*

10I–58 551.573:551.577.2(438)

Schmuck, Adam, **Stopień uwilgotnienia w Polsce w latach 1948–1951.** [Moisture efficiency in Poland in 1948–1951.] *Przegląd Meteorologiczny i Hydrologiczny*, Warsaw, 5(3/4):24–36, **1952.** figs., 5 tables, 7 refs. English summary p. 34. **DWB**—Results of a study of the distribution and alteration of the degree of moisture in Poland are presented. A short method of calculating the annual evaporation E by using the simple formula $E=21d$ was applied (where d is the annual sum of mean monthly saturation deficits; E and d both in mm). The ratio P/E (where P is precipitation) was computed for 42 stations in Poland. Attached maps show that the Odra River basin is more arid than the Vistula basin and that the "degree of moisture" has decreased since 1948. (*Same item as* 5.10–170, Oct. 1954, *MAB.*) *Subject Headings:* **1. Evaporation calculations 2. Precipitation-evaporation ratio 3. Poland.**—*A.M.P.*

10I–59 551.573:551.481(592.66)

Stam, A. H. (*Rijkswaterstaat, 's-Gravenhage*), **Het Verdampingsonderzoek in de Rottegatspolder.** [Evaporation research in the Rottegatspolder.] (In: Nederlandse Centrale Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek, **Verslagen Technische Bijeenkomsten, 1–6, 1946–1950.** 's-Gravenhage, **1952.** p. 13–17. English and French summaries, p. 279, 307.) **DWB**—General discussion. Research to be done on vertical vapor transport, energy balance of soil surface, water balance of polder and on experimental plots under various crops. (*Same item as* 4.11–199, Nov. 1953, *MAB.*) *Subject Headings:* **1. Evaporation 2. Rottegatspolder, Netherlands.**—*A.A.*

10I–60 551.573

Steinhäusser, Hans, **Über die Gebietsverdunstung in den österreichischen Südalpen.** [On the regional evaporation in the Austrian southern Alps.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 35:174–179, **1952.** 5 figs., table, 4 refs. **DWB**—Author discusses the difficulties of estimating evaporation from rainfall and runoff in mountain areas and then gives values for the rivers of the Drava region. He compares these with values found by other workers and with those given by $V=0.143N+69t+52.5$ (V =evaporation mm, N =rainfall, t =regional temperature). Relation of V to height is compared with that in Swiss Alps. (*Same item as* 3.10–215, Oct. 1952, *MAB.*) *Subject Headings:* **1. Evaporation 2. Alps.**—*C.E.P.B.*

10I–61 551.573

Stone, E. L., Jr., **Evaporation in nature.** *Journal of Forestry*, 50(10):746–747, Oct. **1952.** 2 refs. **DLC**—The author thinks that PENMAN and SCHOFIELD, and their work at Rothamsted Experiment Station in England, have at last provided a sound approach to the solution of problems of evapotranspiration. Reviewing the 1948, 1949 and 1951 published works of these authors on evaporation, the stress is laid on radiation as the prime factor in providing energy for evaporation, and although all variations in evapotranspiration cannot be explained on the basis of radiation, it is more important than air temperature, wind movement, humidity, or type of vegetation, canopy, etc. Single trees or plants cannot be used as indicators of areal evaporation. (*Same item as* 5.2–189, Feb. 1954, *MAB.*) *Subject Headings:* **1. Evaporation 2. Evapotranspiration 3. Radiation effects. I. Penman, H. L. II. Schofield, R. H.**—*M.R.*

10I–62 551.573:551.579(73)

*Thornthwaite, Charles W., **Evapotranspiration in the hydrologic cycle.** (In: U. S. Congress. House. Committee on Interior and Insular Affairs, **Physical and economic foundation of natural resources, 2**:25–35, **1952.** 2 tables, 5 figs., 18 refs.) **DWB**—Presents maps of annual potential evapotranspiration and moisture regions in the U. S., as well as the relation precipitation/potential evapotranspiration at four selected stations. An example is given of how to compute the daily water budget of the soil. The available water in the root zone is about 4″, almost independent of the kind of crop and soil. (*Same item as* 6.2–240, Feb. 1955, *MAB.*) *Subject Headings:* **1. Evapotranspiration. 2. Hydrologic cycle 3. Soil moisture 4. United States.**—*A.A.*

10I–63 551.585.5:551.579

†Thornthwaite, Charles Warren, **The water balance in arid and semiarid climates.** Prepared for presentation at the International Symposium on Desert Research, Jerusalem, May 7–14, 1952. Seabrook, N. J., Johns Hopkins University, Laboratory of Climatology, Feb. **1952.** 24 p. 13 figs., tables, bibliog. p. 20–24. Mimeo. **DWB**—A general review on potential evapotranspiration and the author's method for the calculation of the water balance. Examples for Beirut, Jerusalem and different places in the U. S. are given. Better results in semiarid regions can be gained by using a bookkeeping procedure for each single month or even day rather than working with climatological means. (*Same item as* 4.6–212, June 1953, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Hydrologic cycle 3. Agricultural meteorology.**—*A.A.*

10I–64 551.573:551.579.5

Uhlig, Siegfried, **Die Abschätzung der Bodenverdunstung an Hand von Bodenfeuchtemesswerten.** [Determination of soil evaporation by soil moisture measurements.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 35:182–189, **1952.** 7 figs., 2 tables, 16 refs. **DWB**—Author develops a method of estimating evapotranspiration from measurements of soil moisture with corrections for runoff and percolation. (*Same item as* 3.10–216, Oct. 1952, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Soil moisture.**—*C.E.P.B.*

10I–65 551.573:551.579.5:631.67

van Bavel, C. H. M. and Wilson, T. V., **Evapotranspiration estimates as criteria for determining time of irrigation.** *Agricultural Engineering*, St. Joseph, Mich., 33(7):417–418, 420, July **1952.** 2 figs., 2 tables, 11 refs. **DLC**—Comparisons of soil moisture measurements with estimates based on evapotranspiration calculated from long term averages (THORNTHWAITE, PENMAN, and BLANEY and CRIDDLE methods compared for Raleigh and Chapel Hill, N. C.) show little significant difference. An example of a daily soil moisture balance sheet, used for a tobacco field in Ruston coarse sandy loam, shows how dates for irrigation as determined from tensiometer readings seldom vary by more than 1 day from those estimated from evapotranspiration. (*Same items as* 5.6–198, June 1954, *MAB.*) *Subject Headings:* **1. Soil moisture measurements 2. Evapotranspiration estimates 3. Irrigation 4. Raleigh, N. C. I. Thornthwaite, C. W.**—*M.R.*

10I–66 551.573:551.579.5

Vilkner, Hans, **Wasseraufnahme und Verdunstungsschutzwirkung der Pflanzen untersucht mit der Differenzmethode bei der Bodenfeuchtigkeitsmessung.** [Water uptake and protective effect of plants against evaporation investigated by the difference method in measurement of soil moisture.] *Angewandte Meteorologie*, 1(8):235–241, Dec. **1952.** 2 figs., 3 tables, 2 refs. **DWB**—Soil moisture at depths 5–100 cm is measured regularly in two similar fields, one with vegetation, one bare, and differences between fields plotted as isolines on a depth-time diagram. Examples: beanfield and grass: Total loss in beanfield is less than evaporation from bare soil; beans take their moisture mostly from 30–40 cm down. Under grass, surface is drier but deeper soil moister than bare ground. Other plant types are classified according to vertical change of moisture difference and agricultural implications considered. (*Same item as* 4.6–161, June 1953, *MAB.*) *Subject Headings:* **1. Evaporation 2. Soil moisture.**—*C.E.P.B.*

1953

10I–67 551.573:551.579(792)

*Croft, A. R. and Monninger, L. V., **Evaporation and other water losses on some aspen forest types in relation to water available for stream flow.** *American Geophysical Union, Transactions*, 34(4):563–574, Aug. **1953.** 4 figs., 10 tables, 7 refs. **DWB**—Study based on observations made on experimental plots, discussing in detail precipitation, interception, evaporation from snow, rainstorm runoff, summer evapotranspiration, field capacity, depletion-moisture content, soil moisture deficit, effect of root depths, etc. The water available for stream flow is computed, depending on the vegetation cover. Overland and seepage runoff resulted in 30.5″ for an aspen herbaceous cover. Removal of aspen trees resulted in a 4″ increase, without seriously increasing soil erosion. The bare plot showed an additional increase of 4″ but an undesirable increase in surface runoff and soil loss was observed. (*Same item as* 6.3–217, March 1955, *MAB.*) *Subject Headings:* **1. Experimental hydrology 2. Evapotranspiration 3. Soil erosion 4. Utah.**—*A.A.*

10I–68 551.573(43

Fekete, Štefan, **Plošné a časové rozdelenie klimatologického výparu na Slovensku.** [Areal and temporal distribution of climatological evaporation in Slovakia.] *Vodohospodársky Časopis*, Bratislava, 1(1/2):3–34, **1953.** 7 figs., 26 refs., eqs., 14 maps. **DLC**—The fourteen maps of Slovakia presented show lines of equal evaporation for each month, for the year and for the growing season. The evaporation values were computed from precipitation and runoff data for 75 stations, and corrected with the help of temperature data for 49 additional stations. Evaporation in general, methods of its measurement, and computation techniques used in this study are discussed. (*Same item as* 8.9–246, Sept. 1957, *MAB.*) *Subject Headings:* **1. Evaporation distribution 2. Evaporation calculation 3. Slovakia, Czechoslovakia.**—*G.T.*

10I–69 551.577.36(669) 551.5

*Garnier, Benjamin John, **Some comments on the rainfall at University College, Ibadan, during 1952.** *Ibadan, Nigeria. Univ. College. Dept. of Geography, Research Notes*, No. 3:15–20, M **1953.** fig., 4 tables. **DWB**—A brief analysis of the frequency of rainfalls of various amounts and of various durations and correlation of the two quantities. Also the diurnal distribution of rainfall

amounts is analyzed by 4-hourly periods for each month of the year 1952. Evapotranspiration data for University College and Moor Plantation, Ibadan (and other sites in Nigeria) are also summarized in tables. (*Same item as* 6.10–229, Oct. 1955, *MAB.*) *Subject Headings:* **1. Rainfall frequencies 2. Diurnal rainfall variations 3. Evapotranspiration data 4. Ibadan, Nigeria.**—*M.R.*

10I–70 551.573(94)

†Gentilli, J., **Estimating potential evapotranspiration in Australia.** *Western Australia. Univ. Geographical Laboratory, Research Report,* No. 40, **1952?** 20 p. tables, 32 refs., 11 eqs. Mimeo. Also German version: **Die Ermittlung der möglichen Oberflächen- und Pflanzenverdunstung, dargelegt am Beispiel von Australien. Das Suchen nach einer Formel.** [The estimation of the possible evapotranspiration, with Australia as an example: the search for a formula.] *Erdkunde,* 7(2):81–93, June **1953.** fig., tables, 32 refs., 12 eqs. English summary p. 81. **DWB**—Formulas for evaporation E_w from a free water surface are reviewed. The earlier ones, e.g. J. A. PRESCOTT's, give good results for Australia but involve saturation deficit which is not generally known. Definition of potential evapotranspiration E_p is discussed and formulas of H. F. BLANEY and C. W. THORNTHWAITE compared with Australian data and criticized. M. H. HALSTEAD's 1951 theoretical formula $E_p = CL(\rho' T \max - \rho' T \min)$, C = const, L = duration of daylight, ρ = water content of air, is found to agree with Australian data and a chart for northern Australia is prepared. (*Same item as* 6.1–230 and 4.10–188, Jan. 1955 and Oct. 1953, *MAB.*) *Subject Headings:* **1. Evaporation 2. Evapotranspiration 3. Australia.**—*C.E.P.B.*

10I–71 551.573:551.585(415)

*Guerrini, V. H., **Evaporation and transpiration in the Irish climate.** *Eire. Meteorological Service, Technical Note,* No. 14, June **1953.** 34 p. 16 figs., 6 tables, 14 refs. **DWB**—THORNTHWAITE's formula for the computation of potential evaporation as a function of monthly mean temperatures and length of day was tested for conditions in Ireland, comparing computed with measured runoff, and found inadequate. The author does not propose another approach to the problem, but introduces a general adjustment for the winter months and presents rainfall minus evapotranspiration maps for the months March-Oct., as well as maps of accumulated withdrawals of moisture from soil reserves at the end of the months June–Oct. for the whole of Ireland. A battery of evapotranspirometers has been in operation at Valentia since July 1952. (*Same item as* 5.6–194, June 1954, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Evapotranspirometers 3. Runoff 4. Thornthwaite's formula 5. Valentia, Ireland.**—*A.A.*

10I–72 551.573:551.579(43)

*Kalweit, Heino, **Lysimeterbeobachtungen als Grundlage zur Berechnung des Wasserhaushaltes.** [Lysimeter observations as the basis for computation of water balance.] *Zeitschrift für Meteorologie,* 7(2):35–42, Feb. **1953.** 4 figs., 3 tables, 4 refs. **DWB**—Study based on lysimeter observations made in Eberswalde. Percentage of annual evapotranspiration given for each month and different kinds of plant cover. Annual values: bare soil, 216; grass cover without ground water, 358; with ground water, 696 and with young pines, 450 mm. The author tested 16 empirical combinations of formulas, based on saturation deficit (S), temperature, precipitation (N) and water reserve in the soil (W_n), in order to compute evapotranspiration (V) from month to month (all in mm). The best results were obtained by $V_w = -7.75 + 19.03\,S$ for the winter months and $V_s = 21.8 + 8.199\,S - 3646(S/N + W_n)^{0.2}$ for the summer months. Author proposes to use these formulas also for catchment areas. (*Same item as* 5.11–138, Nov. 1954, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Lysimeter observations 3. Hydrologic cycle 4. Eberswalde, Germany.**—*A.A.*

10I–73 551.579(43):551.573

*Kalweit, Heino, **Beitrag zum Gebietsverhalten der Verdunstung in mitteldeutschen Landschaften.** [Contribution to regional evaporation in central Germany.] *Zeitschrift für Meteorologie,* 7(12):373–380, Dec. **1953.** 5 figs., 4 tables, 8 refs. **DWB**—Data presented for annual precipitation (N), runoff (A), evapotranspiration (V) and temperature. A linear relation between V, N and the saturation deficit (S) is proposed and a second-order algebraic equation between V and N is given. Coefficients are given for the separate computation of the apparent evapotranspiration in winter and summer on the basis of the precipitation in the given and the preceding half-year. More precise, but entirely empirical, relations are derived for the computation of monthly evapotranspiration utilizing the saturation deficit. (*Same item as* 5.11–167, Nov. 1954, *MAB.*) *Subject Headings:* **1. Hydrologic cycle 2. Evapotranspiration 3. Central Germany.**—*A.A.*

10I–74 551.573

†Lull, Howard W. (*comp.*), **Evapo-transpiration: excerpts from selected reference.** *U. S. Forest Service. Southern Forest Experiment Station, Occasional Paper,* No. 131, Aug. **1953.** 117 p. **DWB**—Excerpts from 76 papers covering general aspects and separately evaporation, transpiration,

evapotranspiration, roots and their relation to soil moisture. The compilation mainly intends to present the different views, published in English, on the problems in these fields. Also gives some data but practically no formulas. (*Same item as* 5.8–183, Aug. 1954, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Soil moisture.**—*A.A.*

10I–75 551.573:551.577.3:581.11

Morello, Jorge (*Univ. del Litoral*), **Cuanta agua tranpiran las plantas?** [How great is plant transpiration?] *Ciencia e Investigación*, Buenos Aires, 9(2):51–60, Feb. **1953.** 4 figs., 24 refs. **DLC**—Direct and indirect methods of plant transpiration measurement are explained. Daily and annual variations of transpiration and their connections with atmospheric conditions are discussed and the importance of the effect of rainfall distribution on transpiration values is stressed. Typical transpiration amounts are given in graphic form for various types of plant cover such as forest, grassland and cultivated plants in various parts of the world. Transpiration as a factor in climatic classification is also discussed. (*Same item as* 8.1–265, Jan. 1957, *MAB.*) *Subject Headings:* **1. Plant transpiration measurement 2. Transpiration 3. Rainfall effects on transpiration values.**—*G.T.*

10I–76 551.573

Neumann, J. (*Israel Met. Ser., Hakirya, Tel Aviv, Israel*), **On a relationship between evaporation and evapotranspiration.** *American Meteorological Society, Bulletin*, 34(10):454–457, Dec. **1953.** 2 tables, refs., 14 eqs. **DWB**—Heat balance considerations indicate that the annual amount of evaporation from an extensive water surface is greater by some 33% than evapotranspiration from an extensive vegetation-covered land surface having an ample supply of water. The assumption is that the same amount of insolation reaches both surfaces. Turbulence theory is used to show that the above estimate leads to values of the friction velocity (or shearing stress) which are in close agreement with independent results for vegetation-covered land surfaces, indicating the correctness or approximate correctness of the above estimate. The assumption of the demonstration is that the geostrophic wind is the same over both surfaces. It is estimated that the annual amount of sensible heat transferred from the vegetation-covered land surface is some 5 to 10% of the insolation reaching that surface. (*Same item as* 5.8–187, Aug. 1954, *MAB.*) *Subject Headings:* **1. Evaporation-evapotranspiration relationships 2. Turbulence theories.**—*Author's abstract.*

10I–77 551.573:551.579.5

Ostromeki, Jerzy, **Parowanie terenowe pszenicy na madach.** [Evaporation of wheat on loams.] *Gospodarka Wodna*, Warsaw, 13(6):205–209, June **1953.** 6 figs., 5 tables. **DLC**—A report on results of observations of evaporation from wheat plants (summer wheat) on loamy soils of various texture and with different levels of ground water. The experiments were carried out by the Department of Water Economy I.U.N.G. at Bygdoszcz in the years 1950–1952. (*Same item as* 5.10–169, Oct. 1954, *MAB.*) *Subject Headings:* **1. Evaporation from soil 2. Soil moisture 3. Bygdoszcz, Poland.**—*A.M.P.*

10I–78 551.579:551.588.6

†Rakhmanov, V. V., **Kak veliko vliianie lesa na vlagooborot v atmosfere?** [How great is the influence of forests on moisture exchange in the atmosphere?] *Vsesoiuznoe Geograficheskoe Obshchestvo, SSSR, Izvestiia*, 85(1):49–59, Jan./Feb. **1953.** 28 refs. **DLC**—A detailed review of the various opinions on the hydrologic effects of forests, based only on literature published in Russian. One group of scientists assumes that forests transpire much more than other plant associations and therefore intensify the turnover of moisture in the atmosphere. RAKHMANOV points out that the possible increase in evapotranspiration is only a small percentage of the whole moisture transport in the atmosphere and presents a selection of his own data for 11 catchment areas in the upper regions of the Dnieper, showing a definite increase of runoff with forest percentage. The author concludes that forests conserve moisture, but fails to communicate precipitation, temperature and other climatic data for these areas. (*Same item as* 5.7–166, July 1954, *MAB.*) *Subject Headings:* **1. Forest hydrology 2. Hydrologic cycle 3. Transpiration of forests 4. European U.S.S.R.**—*A.A.*

10I–79 551.57(4

Reichel, Eberhard, **Der Wasserhaushalt in Europa.** [The water balance in Europe.] *Umschau*, 53(22):677–680, Nov. 15, **1953.** 3 figs., 4 refs. **DWB**—The three terms Rainfall = Runoff + Evaporation are shown in annual charts for Europe, and the causes of their distribution are discussed briefly. (*Same item as* 5.5–154, May 1954, *MAB.*) *Subject Headings:* **1. Rainfall 2. Evaporation 3. Runoff 4. Europe.**—*C.E.P.B.*

10I–80 551.573:551.579(43

Reichel, Eberhard, **Die Zunahme der Verdunstung als eine Ursache des Wassermangels.** [Increase in evapotranspiration as a cause of water-deficiency.] *Die Wasserwirtschaft*, Stuttgart

43(5):123–126, Feb. **1953.** 5 tables, 9 refs. **DLC**—Starting with 1946, decreasing runoff in German rivers was observed. The author shows that summer and winter precipitation in 1946–1951 was nearly normal, but the (annual) temperature was 0.8° higher. The resulting increase in evapotranspiration was computed according to WUNDT, THORNTHWAITE, BERGSTEN, FISCHER and KELLER and found to be 25–30 [mm/annum °C]. (*Same item as* 5.1–214, Jan. 1954, *MAB.*) *Subject Headings:* **1. Evapotranspiration effects 2. Runoff decrease 3. Germany.**—*A.A.*

10I–81 551.573:631.67(47)

Rozhanskaia, O. D., **Raschet summarnogo ispareniia s oroshaemykh poleĭ, zaniatykh zernovymi kul'turami.** [Computation of total evaporation in irrigated fields cultivated with grain crops.] (In: Akademiia Nauk SSSR, Institut Geografii [and] Institut Lesa, **Mikroklimaticheskie i klimaticheskie issledovaniia v Prikaspiĭskoĭ Nizmennosti.** Moscow, **1953.** p. 154–161. 2 figs., table, refs., 3 eqs. **DLC**—Enumerates and briefly describes five methods of computing total evaporation. Author then presents preliminary data on total evaporation obtained by the methods of turbulent diffusion and heat balance. The material for the computation was obtained in 1951 at the Engels experiment station in Saratov Region. (*Same item as* 6.11–279, Nov. 1955, *MAB.*) *Subject Headings:* **1. Evaporation calculations 2. Irrigated fields 3. Saratov Region, U.S.S.R.**—*A.M.P.*

10I–82 631.67:551.573

Thornthwaite, C. W., **Climate and scientific irrigation in New Jersey.** *Johns Hopkins Univ. Laboratory of Climatology, Publications in Climatology,* 6(1), **1953.** 8 p. **DWB**—The purpose of supplemental irrigation in humid regions like southern New Jersey is stated to be the production of bumper crops every year, and not the occasional saving of a crop during years of extreme drought. In order to do this scientifically (to irrigate soon enough but not to over-irrigate), the author has experimented with methods of measuring evapotranspiration, which when it exceeds rainfall indicates a need for supplemental irrigation and gives a simple index of how much to irrigate. By using these methods in New Jersey the author predicts that a great increase in productivity can be reached in a few years. (*Same item as* 7.8–247, Aug. 1956, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Irrigation 3. Crop yield 4. New Jersey. I. Johns Hopkins Univ. Laboratory of Climatology.**—*M.R.*

1954

10I–83 551.579.5:551.573:581.11

†*Alpat'ev, A. M., **Vlagooborot kul'turnykh rasteniĭ.** [Moisture exchange in crops.] Leningrad, Gidrometeoizdat, **1954.** 247 p. 24 figs., 80 tables (+12 in append.), 167 refs. **DLC**—A comprehensive monograph on the problem of sufficient moisture conditions for cultivated plants in connection with climate and other natural factors. Ample discussion is given of methods for determining the moisture requirements of plants, particularly of grain crops, from a geographical point of view, and verification of these methods in various natural zones. The most important topics discussed are: 1) criteria of transpiration, 2) factors determining the need of water in plants under conditions of optimal soil moisture, 3) total need of water during growing season under conditions of optimal moistening, 4) water consumption by plants as conditioned by the medium and biological development, 5) water exchange in plants in connection with agricultural technique and the influence of species and 6) factors determining the total intake of water by plants under conditions of nonoptimal moistening. A simple method for determining the requirements of water for plants under field conditions from climatological data is suggested. This makes it possible now to determine the surplus or deficiency of moisture in geographical scale in absolute units. (*Same item as* 7.3–242, March 1956, *MAB.*) *Subject Headings:* **1. Soil moisture requirements 2. Transpiration 3. Plant water requirements 4. Grain crops.**—*N. A. Zikeev.*

10I–84 551.573:551.582.3(94)

*Australia. Meteorological Branch, **Evaporation, estimated from saturation deficit (in inches) using the Waite formula E = 21.2 S.D. modified by reference to actual evaporation records.** Rev. May 1953. issued **1954.** unpaged. 15 charts (fold.). **DWB**—Large, nicely drawn charts for Australia (with inset for Tasmania), showing isarithms of evaporation for the year, for May–Oct., for Nov.–April and for each individual month. Intervals of 10″ (20″ to 110″) are used for the annual totals, 5″ for the seasonal (5″–50″ in winter and 15″–70″ in summer), and 1″ for the monthly (3″–14″ in Dec. and Jan., ½″–8″ in July). In S.E. Australia and Tasmania lines are drawn for ½″ intervals up to 2″. (*Same item as* 9.1–236, Jan. 1958, *MAB.*) *Subject Headings:* **1. Evaporation charts 2. Australia 3. Tasmania.**—*M.R.*

10I–85 551.571.7:551.511

Benton, George S. and Estoque, Mariano A., **Water-vapor transfer over the North American continent.** *Journal of Meteorology,* 11(6):462–477, Dec. **1954.** 21 figs., 2 tables, 12 refs., 9 eqs.

DWB—Water-vapor transfer in 1949 was computed at 850, 700 and 500 mb for 30 radiosonde stations from mixing ratio and geostrophic winds, and integrated graphically 400 mb to surface for each month. Results are shown as maps for year, winter and summer, and as zonal and meridional sections. The net inflow of water vapor across boundaries is computed, showing net inflow in winter, spring and autumn and outflow in summer; inflow for year 721×10^8 g/sec. Integrated flow maps are shown also for Jan. (deep trough), Nov. (inflow from Gulf of Mexico, excess precipitation) and Aug. (extreme summer conditions). Annual transport by eddies is estimated. Water balance of North America is calculated as annual march of evapotranspiration and precipitation. (*Same item as* 6.5–205, May 1955, *MAB.*) *Subject Headings:* **1. Water vapor transport 2. North America.**—*C.E.P.B.*

10I–86 551.577.32 551.577.38(675)

*Bultot, F., **Saisons et periodes sèches et pluvieuses au Congo Belge et au Ruanda-Urundi.** [Drought and rain seasons in the Belgian Congo and in Ruanda-Urundi.] *Institut National pour l'Étude Agronomique du Congo Belge. Bureau Climatologique, Communication*, No. 9, **1954.** 70 p. 16 tables, 15 refs., 4 figs., 8 charts (fold.). **DLC**—The contents of this monograph are as follows: mean dates of the beginning of the dry and rainy seasons and the mean duration of the dry season; propagation of the line of demarcation between the dry and rainy zones towards the equator and tropics, respectively; frequency of dry and rainy periods contained in the rainy season; and the drying power of the different Congo climates, including calculation of actual evaporation from a free saturated water surface by the method of heat energy balance, annual evaporation in different regions of the Belgian Congo, etc. Data are presented in tables and as isochrone and isopleth charts. (*Same item as* 6.11–301, Nov. 1955, *MAB.*) *Subject Headings:* **1. Rainy seasons 2. Drought 3. Evaporation 4. Belgian Congo 5. Ruanda-Urundi.**—*I.L.D.*

10I–87 551.573:551.577:551.585

Crowe, P. R., **The effectiveness of precipitation. A graphical analysis of Thornthwaite's climatic classifications.** *Geographical Studies*, London, 1(1):44–62, **1954.** 4 figs., 4 tables, foot-refs. **DLC** (G1.636)—A critical study of THORNTHWAITE'S classification formulas of 1931 and 1948. The value of his *P-E* index (1931) is limited by the probable errors of *P* and *T*, and alternative simpler formulas such as $E = (T - 10)/9$ give equally good results. Potential evapotranspiration (1948) also meets difficulties, particularly in the uncertainty of figures of evaporation, and its basis is illogical. THORNTHWAITE'S treatment of insolation is incomplete. A number of curves of potential evaporation are redrawn on simple numerical scales. THORNTHWAITE'S systems are stimulating but not final. (*Same item as* 6.9–231, Sept. 1955, *MAB.*) *Subject Headings:* **1. Thornthwaite's classification 2. Precipitation effectiveness.**—*C.E.P.B.*

10I–88 551.501:551.573

Gilbert, M. J. and van Bavel, C. H. M. (*N.C., Agric. Experim. Stations*), **A simple field installation for measuring maximum evapotranspiration.** *American Geophysical Union, Transactions* 35(6, Pt. 1):937–942, Dec. **1954.** 2 figs., 4 tables, 6 refs. **DWB**—Soil-filled gasoline drums (55 Tal) have been used to measure maximum evapotranspiration at Waynesville, N. C. Installation involves no mechanical devices, and maintenance is at a minimum. Water is added manually to prevent water supply to the plants from becoming a limiting factor. Tensiometers are used to indicate when water must be added. Tanks are placed in the center of areas of the same vegetation. Data for one year under grass cover are presented and compared with values calculated from THORNTHWAITE'S and PENMAN'S formulas. The latter appears, upon statistical analysis, to fit the data better than the former. (*Same item as* 6.9–232, Sept. 1955, *MAB.*) *Subject Headings:* **1. Maximum evapotranspiration 2. Evapotranspiration measurement techniques 3. Waynesville, N. C.**—*Authors' abstract.*

10I–89 551.573:633.1

Godard, Marcelin, **Action de la température sur la transpiration du maïs: influence variétale** [Effect of temperature and of variety on the transpiration of corn.] *Académie des Sciences, Paris, Comptes Rendus*, 238(24):2343–2345, June 14, **1954.** fig. **DWB**—Amount of evaporation from two varieties of corn was measured under experimental conditions with changing temperature and all other factors constant. A curve showing daily amount of transpiration per unit surface of foliage as a function of temperature is presented for each variety. (*Same item as* 6.1–231, Jan. 1955, *MAB.*) *Subject Headings:* **1. Transpiration of corn 2. Evapotranspiration.**—*G.T.*

10I–90 551.573:551.579

Hallaire, M. (*Stat. Centrale de Bioclimatologie, I.N.R.A.*), **L'évapotranspiration réelle, mesure et interprétation dans les conditions naturelles.** [Actual evapotranspiration, its measurement and

interpretation in natural conditions.] *La Météorologie*, Paris, Ser. 4, No. 36:379-401, Oct./Dec. 1954. 7 figs., 5 tables, 16 refs., eqs. French, English and Italian summaries p. 379. **DWB**—The author states that it is possible to characterize the dryness of the soil and undersoil by a single number S and that effective evapotranspiration E can be evaluated by direct calculation of the water deficiency D. By comparisons with potential evapotranspiration he attempts to define the moment when the plant suffers from lack of water. S and D reach at that moment their critical values representing respectively the drying properties of the culture and the water capacity of a given soil. (*Same item as*: 7.9-190, Sept. 1956, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Soil moisture deficiency.**—*A.M.P.*

10I-91 551.573:633.18

Hanyu, Jyuro and Tsugawa, Kiyoharu (*Aomori Agric. Exper. Sta.*), **A measurement of evaporation from the irrigated paddy field and absorption of water by the paddy rice.** *Journal of Agricultural Meteorology*, Tokyo, 9(3,4):119-120, Aug. **1954.** 2 figs., table, 5 refs. In Japanese; English summary p. 120. **DWB**—Using the apparatus of Fig. 1, authors measured the amount of evaporation from the irrigated paddy field and absorption (transpiration) of water by the paddy rice in each growing period for 1953. These results are shown in Table 1 and Fig. 2. The absorption was slight at first and reached maximum at the beginning of young panicle formation. The evaporation in the paddy field was nearly equal to the evaporation in the observation field at first, but the former gradually had less than the latter. (*Same item as* 6.9-233, Sept. 1955, *MAB.*) *Subject Headings:* **1. Evaporation measurements 2. Rice fields 3. Transpiration.**—*Authors' abstract.*

10I-92 551.573:551.501.4

Ivanov, N. N., **Ob opredelnii velichiny ispariaemosti.** [The determination of the rate of evaporation.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Izvestiia*, 86(2):189-196, March/April **1954.** 1 tables, 9 refs. **DLC**—The author criticizes severely M. I. BUDYKO's method for determining evaporation through radiation balance as suggested in the book **Izmenenie klimata v sviazi s planom preobrazovaniia prirody** (*see* 4.5-1, May 1953, *MAB*). BUDYKO is accused of assuming that evaporation for individual areas is proportional to the radiation balance; this error is attributed to a confusion between evaporation from the surface of the earth and potential evaporation from a water surface. The lack of agreement between the calculations of BUDYKO and those of other investigators is pointed out. (*Same item as* 6.7-247, July 1955, *MAB.*) *Subject Headings:* **1. Evaporation calculations. I. Budyko, M. I.**—*I.L.D.*

10I-93 551.573:551.579(433)

Kern, Helmut, **Verteilungskarten von Landverdunstung und Abfluss.** [Charts of distribution of regional evaporation and runoff.] *Meteorologische Rundschau*, 7(7,8):137-140, July/Aug. **1954.** 3 figs., 11 refs. **DWB**—A chart of mean annual evaporation (1901-50) for Bavaria is constructed by the method of W. WUNDT from station values of precipitation and air temperature. From this and the rainfall map a chart of runoff is drawn. (*Same item as* 6.1-233, Jan. 1955, *MAB.*) *Subject Headings:* **1. Evaporation 2. Runoff 3. Bavaria.**—*C.E.P.B.*

10I-94 551.524.34:551.577.38(43)

Lammert, Walter, **Wie sich unser Klima ändert.** [How our climate changes.] *Wasserwirtschaft*, 44(4):105-106, Jan. **1954.** **DWB**—In spite of the current idea that Central Europe is becoming drier, the fact is that there has been more precipitation in the annual average (500 stations in Germany) in the period 1931-50 than from 1881-1930. However the summers have been somewhat drier. The main factor, aside from greater water use and depletion of ground water resources, has been the increased evaporation as a result of the higher annual (average) temperature. Thus it would take an increase in rainfall to maintain constant soil moisture and water supply. (*Same item as* 6.1-175, Jan. 1955, *MAB.*) *Subject Headings:* **1. Drought 2. Temperature trends 3. Water supply 4. Evaporation 5. Germany.**—*M.R.*

10I-95 551.573

*†Mather, John, **Measurement of potential evapotranspiration.** *Johns Hopkins Univ. Laboratory of Climatology, Publications in Climatology*, 7(1), **1954.** Contract AF 19(604)-193, Scientific Report No. 2; Contract AF 19(604):289, Scientific Report No. 8. 225 p. numerous figs., refs. and tables. **DWB**—Results of evapotranspiration measurements made in several climatic regions of the world from 1947-1953 are reported in this collection of 14 papers. Critical examination is made of the accuracy of the evapotranspirometer and the efficiency of the THORNTHWAITE formula. It is suggested that the formula be simplified for computation purposes. Daily accumulated values are given in tables and graphs. The individual papers are as follows:

Mather, John R.: **A summary of evapotranspiration at Seabrook, New Jersey.** p. 7–51. Daily values of computed and measured potential evapotranspiration, Aug. 1947–Dec. 1953. THORNTHWAITE'S formula underestimates potential evapotranspiration in winter and slightly overestimates in summer. Potential evapotranspiration depends on state of development of plants. (For more detailed abstract, *see* 6.4–250, April 1955, *MAB.*)

Gilbert, M. J.: **Evapotranspiration measurements at Waynesville, North Carolina.** p. 52–54. Potential evapotranspiration was measured in a greatly simplified tank, applying irrigation whenever the moisture tension exceeded 100 cm. Daily losses averaged over irregular periods are given for one year. The annual total agrees quite well with Thornthwaite's computed values.

McCloud, D. E. and Dunavin, L. S., Jr.: **Agrohydrologic balance studies at Gainesville, Florida.** p. 55–68. Weekly data for temperature, precipitation, humidity, evaporation (water tank, atmometer, soil) and evapotranspiration (Bahia-grass, white clover, corn, tobacco) are given for 1952 and 1953. None of the tested formulas (THORNTHWAITE, BLANEY-GRIDDLE, TABOR, PENMAN) gave a satisfactory result. An exponential evaluation with temperature as the argument was fitted to the observations, accounting for 80% of the water losses.

Sanderson, Marie: **Measuring potential evapotranspiration, Toronto 1947, 1948, 1949.** p. 69–83. Also . . . **Norman Wells, Northwest Territories, Canada, 1949, 1950.** p. 84–90. And: **Observations of potential evapotranspiration at Windsor, Ontario, 1953.** p. 91–93. A good general agreement with Thornthwaite's formula was found. (For details, *see* 6.2–238, 6.5–210 and 9.9–223, *MAB.*)

Chapman, L. J. and Linton, G. M.: **Summary report on controlled irrigation at the Orono Nursery.** p. 94–97. Measurements in evapotranspiration tank with red pine seedlings showed agreement with THORNTHWAITE'S formula (For details, *see* 6.3–216, March 1955, *MAB.*)

Guerrini, V. H.: **A year of evapotranspiration in Ireland.** p. 98–111. Computed and measured evapotranspiration (14 tanks) for Valentia (Aug. 1952–July 1953) shows good agreement with THORNTHWAITE'S formula for the vegetation period only. (For details, *see* 6.3–223, March 1955, *MAB.*)

Ramage, C. S.: **Evapotranspiration measurements made in Hong Kong. First report, Oct. 1952 to May 1953.** p. 112–124. Also published as *Hong Kong. Royal Observatory, Technical Note*, No. 7, June 1953. A simplified evapotranspirometer as described by MATHER in 1950 was installed at Hong Kong. Results of measurements made over 20 months are given for grass cover and different vegetables, comparing these with temperature, humidity, wind, etc. THORNTHWAITE'S formula gives a higher annual evapotranspiration and does not agree with the annual course of potential evapotranspiration due to the well marked annual variation of relative humidity in Hong Kong (wet monsoon summers, dry winters).

Smith, G. W.: **Evapotranspiration in Trinidad, B.W.I.** p. 125–139. Errors of Thornthwaite's formula, which neglects humidity, are closely related to evaporation measured by an atmometer (correlation 0.87). Daily values of temperature, precipitation, computed and measured evapotranspiration (4 tanks) or partly evaporation from bare soil are presented for Oct. 1952 to Dec. 1953. (For details, *see* 6.2–239, Feb. 1955, *MAB.*)

Garnier, B. J.: **Measuring potential evapotranspiration in Nigeria.** p. 140–176. A simplified evapotranspirometer, watered from above, was found superior to a tank with constant water level. Daily values of computed and measured potential evapotranspiration, precipitation and temperature are given for 5 places in Nigeria, as well as wet and dry bulb temperature and sunshine for University College at Ibadan. Evapotranspiration measurements were started in June 1951. The results show a fair agreement with Thornthwaite's formula, and an excellent correlation with saturation deficit.

Mather, John R.: **A summary of additional evaporation and evapotranspiration measurement.** Evapotranspiration data for United States and Africa are compared with computed values, giving good agreement with Thornthwaite's formula. Both tank evapotranspiration and tank evaporation can be expressed as a simple power law of the temperature in C°. (For details, *see* 6.4–251, April 1955, *MAB.*)

Thornthwaite, C. W.: **A re-examination of the concept and measurement of potential evapotranspiration.** p. 200–209. Discusses the effect of humidity on the actual evaporation and transpiration, considering height and distance from the water or wet soil, the area of the evaporating surface, moisture content of the soil and albedo. Evapotranspirometers measure the potential evapotranspiration only if similar vegetation and moisture conditions prevail over a certain area (which must be larger in dry climates). The concept of ideal potential evapotranspiration should not include variations in relative humidity, which is not a conservative element. Even the introduction of the daily temperature variation, according to HALSTEAD, should be avoided as a hidden consideration of relative humidity.

Mather, J. R.: **Summary and conclusions.** p. 210–217. "The present formula for computing potential evapotranspiration is laborious and somewhat complicated." Simplification of computational procedures would be desirable.

Thornthwaite, C. W.: **The determination of potential evapotranspiration.** (Reprinted from *Geographical Review*, 38(1):89–94, **1948.**) *Subject Headings:* **1. Potential evapotranspiration 2. Evapotranspiration data 3. Seabrook, N. J. 4. Canada.**—*A.A., G.T.*

10I–96 551.501.4:551.573

Neumann, J., **A note on the estimation of diurnal amounts of evaporation.** *Royal Meteorological Society, Quarterly Journal*, 80(344):236–237, April **1954.** table, 3 refs., 4 eqs. **DWB**—The THORNTHWAITE-HOLZMAN expression for daily mean evaporation, using PASQUILL'S data, becomes

$$E = 4.96 \times 10^{-8} u_{50}(e_{25} - e_{50}).$$

E in g/cm²/sec, u wind in cm/sec and e vapor pressure mm at 25 and 50 cm height. Values are compared calculated from daily mean data, hourly means and daily mean daylight data. (*Same item as* 5.8–186, Aug. 1954, *MAB.*) *Subject Heading:* **1. Evaporation estimation.**—*C.E.P.B.*

10I–97 551.579(43):63

*Pfaff, C. and Friedrich, W., **Die Wasserbilanz des bewachsenen Bodens nach Lysimeter-Versuchen.** [Water balance of the soil under plant cover according to lysimeter studies.] *Wasser und Boden*, Bonn, 6(9), Sept. **1954.** 5 p. 2 figs., 7 tables, 8 refs. **DWB**—As a result of extensive lysimeter studies conducted at the agricultural experiment station of Limburgerhof, Germany, average values of water supply (precipitation and irrigation), infiltration and evaporation are presented for bare soil of different composition and for soil under various plant covers, with or without fertilizer. A scatter diagram showing the correlation between precipitation and evaporation is presented. The data were obtained for periods of varying length between 1932 and 1952. (*Same item as* 6.8–299, Aug. 1955, *MAB.*) *Subject Headings:* **1. Lysimeter investigations 2. Hydrologic cycle 3. Cover influences 4. Limburgerhof, Germany.**—*G.T.*

10I–98 551.573:551.579(611)

*Preziosi, P. C., **Le climat de la Tunisie: évapotranspiration, bilan hydrologique, zones climatiques.** [The climate of Tunisia: evapotranspiration, hydrological balance, climatic zones.] Tunis, **1954.** 7 p. 12 figs., 5 tables. Mimeo. At head of t-p: Service Météorologique de Tunisie. **DWB** (M82.1/611 T926c)—A thorough study of the various elements of the hydrologic cycle important for a study of the evapotranspiration regime in Tunisia. Data for 32 stations are analyzed and presented in tables, on charts, graphs, isohyetal maps, etc. and a more detailed analysis made for 4 principal stations in Tunisia. Water need, actual precipitation, water deficit, water excess, index of aridity, run-off, potential evapotranspiration, actual evapotranspiration, etc. are among elements treated quantitatively and seasonally. Maps give parameters according to various systems. (*Same item as* 9.9–221, Sept. 1958, *MAB.*) *Subject Headings:* **1. Evapotranspiration data 2. Climatic zones in Tunisia 3. Tunisia.**—*M.R.*

10I–99 551.573:551.579:551.501(477)

*Radinovich, N. F., **Isparenie s poverkhnosti pochvy po nabliudeniiam Glukhovskoĭ Agrometeorologicheskoĭ Stantsii.** [Evaporation from the soil surface according to observations at the Glukhov Agrometeorological Station.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, 37(64):3–12, **1954.** 6 tables, 4 refs. **DLC** (QC851.M64)—The results of a ten year study of evaporation from the surface of the soil by means of a Popov evaporimeter-lysimeter are presented. The author discusses the method, including the formulas for working up the observations, the inadequacies of the methods and the Popov evaporimeter-lysimeter, evaporation from the surface of a cleared fallow surface with natural moisture supply, maximum possible evaporation and evaporation from a soil surface under barley. Extensive numerical data are presented in tables. (*Same item as* 9.5–208, May 1958, *MAB.*) *Subject Headings:* **1. Evaporation from land surfaces 2. Popov's soil evaporimeter 3. Glukhov, Ukraine.**—*I.L.D.*

10I–100 551.573:633.13

Rider, N. E., **Evaporation from an oat field.** *Royal Meteorological Society, Quarterly Journal*, 80(344):198–211, April **1954.** 6 figs., 2 tables, 17 refs., 6 eqs. **DWB**—The aerodynamic method of estimating evaporation from wind speed u and specific humidity q at different height z was modified to the equation

$$E = \frac{\rho k^2 (1-\beta)^2 (q_1 - q_2)(u_2 - u_1) Z_0^{2(1-\beta)}}{[(z_2 - d)^{1-\beta} - (z_1 - d)^{1-\beta}]^2} \qquad (4)$$

This was applied to observations in an oatfield; set up shown. A graph for determining surface zero displacement d and hence β at different wind speeds at 2 m is given. Calculated hourly and daily

rates of evaporation are shown, but general application of (4) was impossible owing to uncertainty in wind speeds and value of d; in general, computed water losses are up to 15% too low. (*Same item as* 5.8–189, Aug. 1954, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Oatfields.**—*C.E.P.B.*

10I–101 551.573:551.585(67)

*Sansom, H. W., **Climate of East Africa, based on Thornthwaite's classification.** *East Africa High Commission. Meteorological Dept., Memoirs*, 3(2), **1954.** 49 p. 6 tables, 2 charts (fold.), 27 figs., 10 refs. **DWB**—An analytical study of moisture balance in East Africa, Kenya, Uganda, Tanganyika and Zanzibar based on 24 selected stations for evapotranspiration, and over 100 stations for other elements of the water balance. THORNTHWAITE's formula and classification are discussed critically and are used in calculations and charts. Individual graphs of mean monthly rainfall and potential evapotranspiration are given for 23 stations, and colored isopleth charts show climatic regions of East Africa according to THORNTHWAITE's formula, and seasonal variation of effective moisture in East Africa. A scatter diagram shows relation of thermal efficiency to altitude (sea level to 9000 ft) in East Africa, using records for >100 stations. (*Same item as* 7.3–217, March 1956, *MAB.*) *Subject Headings:* **1. Potential evapotranspiration 2. Thermal efficiency 3. Thornthwaite's classification 4. East Africa.**—*M.R.*

10I–102 551.579:551.588.

Smirnov, V. V. and Odinokova, N. S., **Gidrologicheskaia rol' osinovykh lesov.** [Hydrological role of aspen forests.] *Akademiia Nauk SSSR, Doklady*, 99(5):849–852, Dec. 11, **1954.** fig. 3 tables, 10 refs. **DLC**—An experimental study of the hydrologic role of aspen was carried out on plots with dark gray, heavy clayey forest soil An analysis of the moisture balance showed that transpiration of aspen stands depended upon their growth. The greatest amount of moisture expended for transpiration is when the aspen trees are 25 yrs old and the least amount when they are 8 and 37 yrs old. (*Same item as* 6.9–274, Sept. 1955, *MAB.*) *Subject Headings:* **1. Forest hydrology 2. Hydrologic cycle 3. Transpiration of forests.**—*I.L.D.*

10I–103 551.573:551.577.3:551.579.5:631.

Smith, L. P., **Calculating irrigation needs.** *Scientific Horticulture*, Wye, 11:11–17, **1952** [54] 4 figs. **DA**—The ideas of H. L. PENMAN on potential transpiration are summarized. Monthly values for British stations show a linear relation to duration of sunshine. From calculated potential transpiration and rainfall, maximum output of water from soil can be calculated and irrigation computed for a planned deficit (a small deficit is preferable to irrigating to capacity). (*Same item as* 7.7–192, July 1956, *MAB.*) *Subject Heading:* **1. Irrigation calculations.**—*C.E.P.B.*

10I–104 551.579.5(46

Tamés, C., **El régimen de humedad de la España peninsular en relación con la agricultura durante el período 1940–1953.** [Humidity regime in peninsular Spain in relation to agriculture during 1940–1953.] Madrid, **1954.** 7 p. 8 refs., numerous maps (colored). Note: at head of t-p Ministerio de Agricultura. Instituto Nacional de Investigaciones Agronómicas. **DLC** (QC925.4 S8T3)—Numerous beautifully multicolored charts of Spain are presented to show the moisture regime for the agricultural year 1940–41, 1941–2, 1942–3, . . . 1952–3, for the normal year, the most dry and most humid year. The last 3 charts are repeated on each of the 13 presentations to allow visual comparison with the conditions of the current agricultural year. The scale of colors is based on THORNTHWAITE's evapotranspiration formula, using 9 categories: A, superhumid (>100), B_4, B_3, B_2 and B_1, humid with 4 degrees (80–100, 60–80, 40–60 and 20–40); subhumid, C_2 (0–20 dry subhumid, C_1 (−20 to 0); D, semi arid (−40 to −20) and E, arid (−60 to −40). The most humid year was 1940–41 and the driest 1944–5, although 1948–9 and 1952–3 were almost as dry with half of the country classed as arid (E) and 90% semi-arid (D) or arid (E). Methods are explained in text. *Subject Headings:* **1. Effective moisture charts 2. Moisture regime of Spain 3. Spain.**—*M.R.*

10I–105 551.586:

†Thornthwaite, C. W. and Mather, J. R., **Climate in relation to crops.** *Meteorological Monographs*, Boston, 2(8):1–10, Oct. **1954.** 3 figs., 3 tables, 32 refs. **DWB**—The history of studies on the relationship between temperature and plant growth since RÉAUMUR introduced the concept of temperature summation and the inadequacy of the ordinary meteorological statistics, particularly temperature, are reviewed. The refinement of the "heat unit" concept by THORNTHWAITE and its application to crop scheduling is outlined. The nature of the concept of potential evapotranspiration its investigation up until 1955 at the Johns Hopkins University Laboratory of Climatology at Seabrook, N. J., and the application of this concept to scheduling the harvesting of peas and other plants and to scheduling irrigation are discussed. (*Same item as* 6.11–83, Nov. 1955, *MAB.*) *Subj*

Headings: **1. Climatic influences 2. Crop ecology 3. Evapotranspiration 4. Agricultural meteorology.**—*I.L.D.*

10I–106 625:631.4:551.573:551.579.5

*†Thornthwaite, Charles W.; Krimgold, D. B.; Mather, John R. et al., **Estimating soil tractionability from climatic data.** Johns Hopkins Univ. Laboratory of Climatology, Contract AF 19(604)-93, Final Report; *Publications in Climatology*, 7(3), **1954.** 447 p. tables, numerous refs. **DWB**—Twelve articles by THORNTHWAITE, KRIMGOLD and MATHER deal with various aspects of the application of THORNTHWAITE'S evapotranspiration concepts to soil moisture research, as follows: general description of present and planned work at the Laboratory of Climatology (for abstracts, *see* 7.7–221, 7.8–189 and 10C–116, *MAB*), investigation of THORNTHWAITE'S evapotranspiration formula (*see* 8.1–264), infiltration rate (7.7–222, 10C–61), computation of soil moisture (9.7–246, 6.5–264), hydrological and mechanical properties of soils (7.7–223, 6.5–213), economic feasibility of supplemental irrigation (10C–62) and preparation of climatic maps (8.1–330). According to MATHER'S article, **Investigation of Thornthwaite's evapotranspiration formula and procedure,** no satisfactory modification of the original equation, proposed by THORNTHWAITE, for the computation of potential evapotranspiration was found. A rational energy balance approach is promising. The ratio between heat used for evaporation and the total available heat seems to depend linearly on soil moisture. (*Subject Headings:* **1. Potential evapotranspiration 2. Soil trafficability 3. Thornthwaite's method. I. Johns Hopkins Univ. Laboratory of Climatology II. Contract AF 19(604)-193.**—*G.T., A.A.*

10I–107 551.573

Uhlig, Siegfried (*Bad Kissingen*), **Berechnung der Verdunstung aus klimatologischen Daten.** [Calculation of evaporation from climatological data.] *Germany. Deutscher Wetterdienst, Mitteilungen*, No. 6, Jan. **1954.** 24 p. 13 figs. **DWB**—Measurements of potential evaporation, according to WILD, PICHE and POPOV are compared with equations proposed by different authors. THORNTHWAITE'S formula gave too high and ALBRECHT'S too low values. For the computation of the actual evapotranspiration a modified method which considers the saturation deficit and soil moisture was adopted. (*Same item as* 5.10–173, Oct. 1954, *MAB*.) *Subject Headings:* **1. Potential evapotranspiration 2. Evapotranspiration.**—*A.A.*

10I–108 551.573

Uhlig, Siegfried, **Zur Bestimmung der potentiellen Verdunstung bewachsenen Bodens.** [Determination of potential evapotranspiration from ground covered with vegetation.] *Wasserwirtschaft*, 44(12):209–315, Sept. **1954.** 8 figs., 4 tables, 9 refs. **DLC**—It was found that potential transpiration measured from a 1m² tank with a constant water level (40–50 cm from the surface) at Eberswalde is closely related to the saturation deficit if a factor varying seasonally from 0.54 to 0.95 is introduced. Some allowance was made for the increased water loss due to the small size of the tank. The results were compared with methods proposed by HAUDE (saturation deficit at 1400), PENMAN and THORNTHWAITE, and were found to be superior, especially considering the simplicity of the method. The seasonal march of potential evapotranspiration is computed for a number of German stations, and a map for July alone is presented. (*Same item as* 6.10–207, Oct. 1955, *MAB*.) *Subject Headings:* **1. Potential evapotranspiration 2. Lysimeter measurements 3. Saturation deficit 4. Eberswalde, Germany. I. Haude, W. II. Penman, H. L. III. Thornthwaite, C. W.**—*A.A.*

10I–109 551.573:631

Unger, K., **Zur Abschätzung von Verdunstungsunterschieden verschiedener Pflanzenbestände am natürlichen Standort.** [On the estimation of differences of evaporation of different natural plant stands.] *Angewandte Meteorologie*, 2(1):1–4, Feb. **1954.** 16 figs., 18 refs., 15 eqs. **DWB**—The evaporation formula of THORNTHWAITE and HOLZMANN (*Monthly Weather Review*, 67:4–11, **1939**; *see* K–92, Nov. 1950, *MAB*) is discussed in the light of PASQUILL'S studies (*Roy. Met. Soc., Quart. J.*, 75:249–256, **1949**; *see* K–174) and an expression is derived for the difference of evaporation from two sites. ALBRECHT'S method of estimating evaporation from heat exchange is set out and a portable apparatus described. Results are used to compare determinations of evaporation by PASQUILL'S and ALBRECHT'S methods and to examine effect of wind velocity and air temperature on evaporation from bare soil and grass and from stands of potato, pea and cabbage. Diurnal variations on selected days are compared; there is general agreement with Leistner-Robitzsch evaporimeter. (*Same item as* 5.7–135, July 1954, *MAB*.) *Subject Heading:* **1. Evapotranspiration.**—*C.E.P.B.*

10I–110 551.579:551.573(795)

†*U. S. Corps of Engineers, **Precipitation, evapotranspiration and runoff, Willamette Basin Snow Laboratory.** Its *Snow Investigations Research Note*, No. 20, July 30, **1954.** 26 p. 2 plates (fold.),

4 tables. 31 refs., appends. **DWB**—Method of generalizing rainfall, evaporation and runoff data from gage measurements to a small basin (Willamette Basin in Cascades of Oregon) is described and results presented and analyzed. Yearly mean precipitation calculated for basin as runoff plus evapotranspiration is considered more accurate for basin as a whole than when calculated from rain gage data, even though there is one gage per square mile. Potential evapotranspiration is calculated according to THORNTHWAITE'S method. Isohyetal maps are drawn for the basin to show gage catch deficiencies for 15 yr period. Mean gage catch deficiency for 15 gages was 14% in 1949–50 and 17% in 1950–51. These are said to be low deficiencies because the mean wind speeds prevailed during these years, but since precipitation averages >100″ a year, the total precipitation deficiency is considerable. Areal distribution is shown in maps and discussed. (*Same item as* 6.7–292, July 1955, *MAB.*) *Subject Headings:* **1. Hydrologic cycle 2. Rain gage networks 3. Evapotranspiration 4. Willamette Basin, Oregon.**—*M.R.*

10I–111 551.573:551.585.5(47)

Zubenok, L. I., **Ob opredelenii ispariaemosti dlia zasushlivykh raĭonov SSSR.** [Evaporation determination for arid districts of the U.S.S.R.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Izvestiia* 86(6):542–545, Nov./Dec. **1954**. fig., 6 refs. **DLC**—The empirical method of N. N. IVANOV and the heat balance method of BUDYKO for measuring potential evaporation are discussed. BUDYKO'S method gives results which agree with actual field measurements. The formula for potential evaporation, developed by BUDYKO $31/L(R_0-B)$, where L = latent heat of evaporation, R_0 = magnitude of radiation balance of an active surface at a given place and B = heat exchange in the soil, is used to calculate potential evaporation for April–Sept. for lat. 40°–55° in the U.S.S.R. (*Same item as* 8.3-241, March 1957, *MAB.*) *Subject Headings:* **1. Evaporation calculations 2. Potential evaporation 3. Arid climates 4. U.S.S.R.**—*I.L.D.*

1955

10I–112 551.579.5:551.573:631.67(788)

Blaney, Harry F., **Climate as an index of irrigation needs.** *U. S. Dept. of Agriculture, Yearbook 1955*:341–345, pub. **1955**. tables. **DA, DWB**—The BLANEY-CRIDDLE formula used to correlate consumptive-use data for different crops with monthly temperature, per cent of daylight hours, precipitation, frost-free period or irrigation season is $U=KF=\Sigma kf$, where U is consumptive-use of crop (evapotranspiration) in inches for any period, F is the sum of the monthly consumptive-use factors (f) for the period which in turn is the product of mean monthly temperature and per cent of daytime hours of the year (as given in table for lat. 24°, 26° . . . 48°, 50°N, for each month). K is an empirical coefficient for growing or irrigation season, and k the monthly coefficient. Method of use, irrigation efficiency, and consumptive use-rainfall (U-R) are tabulated for various crops for Montrose, Colo. (*Same item as* 7.10–250, Oct. 1956, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Plant water requirements 3. Irrigation 4. Montrose, Colo.**—*M.R.*

10I–113 551.573(794):551.48

*Blaney, Harry F. and Muckel, Dean C., **Evaporation and evapotranspiration investigations in the San Francisco Bay Area.** *American Geophysical Union, Transactions*, 36(5):813–820, Oct. **1955**. fig., 9 tables, 7 refs. **DWB, DLC**—During 1953 and 1954 studies were made to determine probable evaporation and evapotranspiration losses that would occur if barriers were constructed across the San Francisco Bay to exclude salt water. This would create fresh-water pools to conserve water for irrigation, domestic and industrial use. Available measurements of evaporation and consumptive use of water by vegetation were compiled and analyzed. New climatological stations were established in areas not covered by existing stations and measurements made on evaporation, temperature, humidity, wind movement and precipitation. Evaporation and consumptive use data were correlated and climatological records and estimates were made of annual and monthly rates of evaporation from lake surfaces and consumptive use by marsh vegetation for the 1921–1952 period and for the five critical years—1923, 1924, 1930, 1931 and 1951. (*Same item as* 7.10–217, Oct. 1956, *MAB.*) *Subject Headings:* **1. Evapotranspiration losses 2. Evaporation from lakes 3. San Francisco, Calif.**—*Authors' abstract.*

10I–114 551.501.4:551.573:551.585

Budyko, M. I., **Klimaticheskie usloviia uvlazhneniia na materikakh. Soobshchenie 1.** [Climatic conditions of moisture on continents, Pt. 1.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geog.* No. 2:5–15, March/April **1955**. Bibliog. p. 14–15. Also **Pt. 2.** *Ibid.*, No. 4:3–15, July/Aug. **1955**. 4 figs., map (fold.), 12 refs., 6 eqs. **DLC**—In Pt. 1 early and recent moisture indexes developed by Russian authors, and their merits and disadvantages are reviewed in detail, with numerous literature references. In Pt. 2 the complex method of determining evaporation, which takes into account simultaneously radiational balance, temperature and atmospheric humidity, is presented together with the appropriate formula, and three methods for determining evaporation—on the basis of saturation deficit of the atmosphere, temperature summation and radiational balance—are evaluated

t is shown that radiational balance is the most useful magnitude for determining annual operation nd a map showing the radiational index of aridity is constructed and reproduced. (*Same item as* .6–115, June 1957, *MAB.*) *Subject Headings:* **1. Evaporation calculations 2. Aridity index.** —*I.L.D.*

10I–115 551.573:016

†Budyko, M. I., **Ob opredelenii ispareniia s poverkhnosti sushi.** [Determination of evaporation rom land surface.] *Meteorologiia i Gidrologiia*, Leningrad, No. 1:52–58, Jan./Feb. **1955.** 32 refs., 5 eqs. **DWB**—The author reviews briefly the principal methods of determining evaporation from and. These include the water balance method; the relationships between evaporation, precipitation nd potential evaporation; the method of POLIAKOV involving the dynamics of moisture in the upper oil layers; the climatic method of calculating annual variation of evaporation developed by AL-BRECHT and the author's own method of calculating annual evaporation by solving the equations of water and heat balance. An extensive bibliography on the problem of measuring evaporation from and is given. (*Same item as* 7.2–203, Feb. 1956, *MAB.*) *Subject Headings:* **1. Evaporation calculations 2. Evaporation from soil. 3. Evaporation bibliographies.**—*I.L.D.*

10I–116 551.573:551.579.5:633

Butler, P. F. and Prescott, J. A. (*both, Waite Agricultural Research Inst., Adelaide Univ.*), **Evapotranspiration from wheat and pasture in relation to available moisture.** *Australian Journal of Agricultural Research*, Melbourne, 6(1):52–61, Jan. **1955.** 3 tables, 4 figs., 11 refs. **DWB**—The changes of soil moisture to a depth of 5 ft in a simple crop rotation and under permanent pasture during 1948–1949–1950 have been followed in detail. Calculations have been made on a monthly basis of the water storage in the soil and of the evapotranspiration from wheat and pasture and of losses from a bare fallow. It is shown that in these experiments the relationship between evapotranspiration, evaporation from water, storage of water in the soil, and rainfall can be expressed in the form $uI_{tr}/dW = c(2.4 - I_{tr})$, where $I_{tr} = E_{tr}/E_w{}^{0.27} = 2.4$ when available water is no longer limiting, and $c = 0.12$ for wheat, $c = 0.10$ for pasture, E_{tr} = evapotranspiration, E_w = evaporation from a free water surface, W = stored water plus rainfall = available water. Water losses from a bare fallow were found to be determined principally by rainfall and soil storage. (*Same item as* 7.6–175, June 1956, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Soil moisture conductivity.**—*Authors' abstract.*

10I–117 551.573:551.577(437.6)

Csehidi, Géza, **A párolgás megoszlása Szlovákiában.** [Distribution of evaporation in Slovakia.] *Hidrológiai Közlöny*, Budapest, 35(5/6):213–214, May/June **1955.** 2 figs., 2 refs. **DWB**—Two maps of Slovakia are presented, showing 1) isolines of annual mean evaporation (according to O. DUB) and 2) evaporation during the growing season expressed in percentage values of the annual evaporation (according to S. FEKETE). Annual evaporation was determined from precipitation and runoff charts (1931–1940) as the difference between precipitation and runoff. Monthly evaporation values were derived from the annual evaporation and the monthly saturation deficit (1901–1940). It appears that evaporation exceeds precipitation values near the Danube and Tisza Rivers in summer. In other regions precipitation exceeds evaporation throughout the year. (*Same item as* 7.11–237, Nov. 1956, *MAB.*) *Subject Headings:* **1. Evaporation data 2. Precipitation-evaporation ratio 3. Slovakia.**—*G.T.*

10I–118 551.573:551.571.3(43)

Dammann, W., **Klimatische Unterschiede der Verdunstungskraft.** [Climatic variation of evaporative power.] *Wasserwirtschaft*, Stuttgart, 46(2):37–40, Nov. **1955.** 5 figs., table. **DLC**—Frequency of saturation deficit for day and night, summer and winter are given for Norderney and Göttingen, as well as maps for summer values at 1400h over northwest Germany. Differences depending on weather conditions are explained. (*Same item as* 8.3–238, March 1957, *MAB.*) *Subject Headings:* **1. Saturation deficit 2. Evaporation 3. Northwest Germany.**—*A.A.*

10I–119 551.501.4:551.579:551.573(540)

*Dhir, R. D.; Ahuja, P. R. and Krishnamurthy, K. V. (*all, Central Water and Power Commission, India*), **Estimation of monthly runoff with due allowance to the ground water factors in infiltration and regeneration.** (In: India. Central Board of Geophysics, **Proceedings of the Symposium on Ground Water, New Delhi, Feb. 1955.** [pub. **1958.**] p. 182–195. 3 figs., 8 tables.) **DWB**—Five-year averages of monthly rainfall and runoff for the Penner River at Sangam, India (1927–31) are plotted in a histogram and shown in a table. The same is done for the Mahanadi River at Samgalpur, and coefficients for each month are calculated for the Sone Basin (39 years), the Penner Basin (40 years), the Damodar Basin (16 years) and the Mahanadi Basin (23 years), to show the difference between computed and actual runoff. Computations are made on the basis of KHOSLA's

formulas: $L_m = T_m - 32/95$; $R_m = P_m - L_m$; $R_A = \Sigma R_m = \Sigma P_m - \Sigma L_m$ where L is evapotranspiration loss in inches, R is runoff in inches and P is precipitation in inches. Suffixes m and A denote monthly and annual values, and C and a values computed by KHOSLA's formula, and actual values respectively. An extended table gives values of $R_c - D - R_m$ for the Sone Basin for each month of each year from June 1903–December 1945. Finally, the monthly correlation coefficients for 3, 5, 10, 20 and 40 yrs between $R_c - D$ and P_m are tabulated and shown on a regression diagram. Differences (D) between results of KHOSLA's formula and actual runoff are due to neglect of regeneration and infiltration. *Subject Headings:* **1. Runoff calculations, India 2. Evapotranspiration losses in river basins 3. India.** —*M.R.*

10I–120 551.582.3:551.573(679)

*Espírito Santo, Tomás Rebelo, **Ensaio para o estudo do clima da Província: aplicação da nova classificação de Thornthwaite.** [Experiment for the study of the climate of the Province (of Mozambique): application of Thornthwaite's new classification.] Lourenço Marques, Imprensa Nacional de Moçambique, **1955.** 45 p. 3 figs., 9 maps (fold.), 6 tables, 10 refs. At head of cover: Província de Moçambique, Serviço Meteorológico.—An elaborate monograph based on computed potential evapotranspiration (obtained from temp., precip. and humidity data for 1901–30 for the dense network of stations and posts in Mozambique), according to THORNTHWAITE's "new" classification system. Theory and methods are described, numerous tables give values of elements (some of which are presented graphically to show seasonal variations), and a number of large folded charts show isarithms of potential evapotranspiration, thermal efficiency, temp., precip. and a classification according to the above system and according to humidity alone, to water excess, and to water deficiency. (*Same item as* 9.1–268, Jan. 1958, *MAB.*) *Subject Headings:* **1. Climate of Mozambique 2. Potential evapotranspiration charts 3. Thornthwaite's classification 4. Mozambique.**—*M.R.*

10I–121 551.501.4:551.573

Felméry, László, **Kisérlet természetes felszinek párolgásának mehatározására.** [An attempt to determine evaporation from natural surfaces.] *Időjárás*, Budapest, 59(2):86–96, March/April **1955.** tables, 12 refs., eqs. Russian and French summaries p. 86. **DWB**—Current methods of determining evaporation amount are discussed; results obtained by such methods at the micro-climatological station Erdőhátpuszta are reported. The method believed to be most accurate (THORNTHWAITE-HOLZMAN method) is applied to the investigation of evaporation from soils under different forms of cultivation. (*Same item as* 7.11–104, Nov. 1956, *MAB.*) *Subject Headings:* **1. Evaporation calculations 2. Thornthwaite-Holzman method 3. Evaporation from soil.**—*Transl. of author's abstract.*

10I–122 551.501.4:551,57

Haude, Waldemar, **Zur Bestimmung der Verdunstung auf möglichst einfache Weise.** [Estimation of evaporation in the simplest manner possible.] *Germany. Deutscher Wetterdienst, Mitteilungen*, 2(11), **1955.** 24 p. 11 figs., 4 tables, 21 refs. **DWB**—This study is concerned primarily with the determination of the saturation deficit and the validity of the mean monthly value of this coefficient. Potential and actual evaporation from bare soil was determined in pentad-values by single daily measurements of saturation deficit at 1400 hours with proper consideration of wind velocity or its deviation from monthly mean value. These values were compared with values obtained by means of the Piche evaporimeter which integrates potential evaporation over a period of time. The relationship between potential evaporation and actual evaporation or saturation deficit is considered. The potential evaporation of oats and potatoes and their relationship to potential evaporation from cultivated soil and to the saturation deficit is examined. (*Same item as* 7.7–189, July 1956, *MAB.*) *Subject Headings:* **1. Evaporation estimation 2. Saturation deficit 3. Potential evaporation.**—*I.L.D.*

10I–123 634.94:551.579

Hayes, G. L. and Buell, Jesse H. (*both, U. S. Forest Service*), **Trees also need water at the right time and place.** *U. S. Dept. of Agriculture, Yearbook, 1955*:219–228, pub. **1955. DA, DWB**—Transpiration from forests is discussed in relation to tree growth, size and climatic factors. Where air is dry and winds strong, trees do not grow tall, but where moist or calm conditions prevail trees grow big. Greatest growth is in winter. THORNTHWAITE's classification of climates is examined in relation to tree growth, and the different zones of the earth, and especially of the U. S. are discussed at greater length. Increased success in tree growth can be attained if areas with sufficient soil moisture are used for planting, and if cultivation and conservation of moisture are properly carried out. In dry areas (16"–18" precipitation per year) drought years may be critical for fallowing cannot be practiced as in grain cultivation. In moist areas shrubs and other weeds must be kept down. (*Same item as* 8.6–93, June 1957, *MAB.*) *Subject Headings:* **1. Tree growth 2. Forest meteorology 3. Transpiration of trees 4. Soil moisture.**—*M.R.*

10I–124 551.577.38:551.573(763):631.67

*Holcombe, J. L. and Wiegmann, Fred H., **Drought intensity and irrigation needs for cotton in the St. Joseph area.** *Louisiana. Agricultural Experiment Station, Baton Rouge, Dept. of Agricultural Economics, Circular*, No. 185, Dec. **1955.** 47 p. figs., tables, foot-refs., 15 refs. in bibliog. **DWB** (M77.38 H725d)—In order to obtain an accurate estimate of the economic advantage or disadvantage of supplemental irrigation over a period of years, a rational method of estimating drought hazard is required. Not only precip. but temp., humidity and hours of daylight, and agronomic factors must be considered. THORNTHWAITE'S method of estimating daily evapotranspiration was used for analyzing records for St. Joseph, La. for period April 15–Aug. 14 for the years 1914–1954 (41 years). The general method of estimating drought hazard was that of VAN BAVEL (1952–3; *see* 10I–55 above and 6.1–279, Jan. 1955, *MAB*) and separate estimates were made for Mhoon and for Commerce loams. Data are presented in several ways (i.e., (1) drought days, (2) number of irrigations and (3) rainfall deficiency) in tables and graphs and are discussed in text. (*Same item as* 9.2–123, Feb. 1958, *MAB*.) *Subject Headings:* **1. Drought intensities 2. Irrigation 3. Evapotranspiration estimates 4. Cotton 5. St. Joseph, La.**—*M.R.*

10I–125 551.579.5:581.03

Hounam, C. E., **Determination of the end of the growing season.** *Australia. Bureau of Meteorology, Meteorological Study*, No. 4, April **1955.** 16 p. 5 figs., 2 tables, 16 refs., eqs.—The purpose of this study was to estimate the moisture conditions of the soil during the growing season and the dates on which soil moisture reserves were exhausted over a period of years and to establish a normal end of growing season at selected stations in Victoria. The contents of this study include the following: definition of growing season, the inadequacy of average monthly rainfall as a measure of the length of the growing season, the concept of effective rainfall, the combination of effective and average rainfall for determining the growing season, the application of daily rainfall data to determine growing season and its correction for evapotranspiration losses, the graphical presentation of rainfall-evapotranspiration decline curves, determination of end of growing season from curves and the comparison of calculated dates with observational data. (*Same item as* 7.3–244, March 1956, *MAB*.) *Subject Headings:* **1. Growing season 2. Soil moisture determinations 3. Evapotranspiration.**—*I.L.D.*

10I–126 551.573

Mather, John R. and Smith, G. W., **Potential evapo-transpiration.** *Weather*, 10(7):245–246, July **1955.** ref. **DWB**—MATHER, referring to an article by GARNIER and LEWIS (*see item* 6.8–276, Aug. 1955, *MAB*), emphasizes the need for more observations of potential evapotranspiration, and for a clear understanding of difference between actual and potential evapotranspiration. The latter does not depend on type of vegetation and shows water need of plants in a particular climate. The program at Centerton, N. J., is discussed. SMITH discusses calculation of evapotranspiration in Trinidad by PENMAN'S method, and supports use of a grass surface as a standard. (*Same item as* 6.10–206, Oct. 1955, *MAB*.) *Subject Heading:* **1. Potential evapotranspiration.**—*C.E.P.B.*

10I–127 551.501.4:551.573

Mezentsev. V. S., **Eshche raz o raschete srednego summarnogo ispareniia.** [More on the calculation of mean total evaporation.] *Meteorologiia i Gidrologiia*, Leningrad, No. 5:24–26, Sept./Oct. **1955.** 2 tables, 5 refs., 17 eqs. **DWB, DLC**—The author discusses analytically the various expressions developed by E. M. OL'DENKOP, BUDYKO and N. A. BAGROV to express the relationship between the maximum possible total evaporation and heat energy resources. The formula of N. A. BAGROV in the form $x = \int_0^z \frac{dz}{1-(z/z_m)^n}$ was found to be more general. Its application to the western Siberian lowland is illustrated. (*Same item as* 8.5–133, May 1957, *MAB*.) *Subject Heading:* **1. Evaporation calculations.**—*I.L.D.*

10I–128 551.573

Melchanov, L. A., **Novaia karta ispariaemosti na territorii Sredneĭ Azii.** [New potential evaporation map for Central Asia.] (In: Akademiia Nauk Uzbekskoĭ SSR. Institut Matematiki i Mekhaniki, **Meteorologiia i gidrologiia v Uzbekistane.** Tashkent, pub. **1955.** p. 35–39, fig., 6 refs., eq.) **DLC**—The distinction between actual and potential evaporation is discussed and the formula for calculating potential evaporation developed by N. I. IVANOV and modified by the author, namely:

$$E = 0.00144(25+T)^2(100-a)$$

is used to construct a map giving isolines of potential evaporation in Central Asia (E = monthly potential evaporation in mm, T = mean monthly air temperature, a = mean monthly relative humidity). A map with isolines of annual potential evaporation in Central Asia is presented. The

author discusses the characteristics of evaporation as indicated by measurements made with a Wild evaporimeter at Tashkent and Turtkul; the range of annual potential evaporation for various years and the annual distribution of potential evaporation in Central Asia. (*Same item as* 9.11-230 Nov. 1958, *MAB.*) *Subject Headings:* **1. Potential evaporation 2. Central Asia.**—*I.L.D.*

10I–129 551.579.4:551.573(569.4)

Neumann, J. (*Israel Met. Serv.*), **On the water balance of Lake Huleh and the Huleh Swamps 1942/43–1946/47.** *Israel Exploration Journal*, 5(1):49–58, **1955.** 2 tables, 10 refs., 10 eqs. **DLC** Reprinted as *Israel. Meteorological Service, Ser. D, Contributions*, No. 5.—The water balance of Lake Huleh and the Huleh Swamps for the period 1942/43–1946/47 is as follows: inflow in the Jordan at Huliyath $=490\times10^6 m^3/yr$; precipitation over the lake and swamps $=25\times10^6 m^3/yr$; runoff from the catchment between Huliyath and the Bridge of the Daughters of Jacob (as computed by an empirical regression formula) $=140\times10^6 m^3/yr$; evapotranspiration from the swamps $=35\times10^6 m^3/yr$ and evaporation from the lakes $=25\times10^6 m^3/yr$. The computed total inflow of $595\times10^6 m^3/yr$ compares with a measured surplus of $590\times10^6 m^3/yr$. The equations for calculating evaporation and evapotranspiration are developed and it is shown that evapotranspiration rates from an extensive vegetation surface are less than that from an adjacent water surface. (*Same item as* 9.5–232, May 1958, *MAB.*) *Subject Headings:* **1. Hydrologic cycle 2. Evapotranspiration 3. Waters of Merom Palestine.**—*I.L.D.*

10I–130 551.573:551.577.33:551.57

Penman, H. L., **Components in the water balance of a catchment area.** *Royal Meteorological Society, Quarterly Journal*, 81(348):280–284, April **1955.** fig., 2 refs. **DWB**—The annual cycle of ground water, soil moisture, rainfall and runoff is described, with figures for the Thames 1931–1936. Rainfall and runoff are known accurately; the chief difficulties are the estimation of storage and the behavior of plants and soils. (*Same item as* 6.7–249, July 1955, *MAB.*) *Subject Heading:* **1. Hydrologic cycle.**—*C.E.P.B.*

10I–131 551.573:551.588.6(687

Rycroft, H. B. (*Dir., Natl. Botanic Gardens, Kirstenbosch*), **The effect of riparian vegetation on water-loss from an irrigation furrow at Jonkershoek.** *South African Forestry Association, Pretoria Journal*, No. 28:2–8, **1955.** 2 figs., 2 photos., table, 16 refs. **DWB**—During hot dry weather the streams in the Stellenbosch area of Cape Province often dry up during the day and flow again at night leading to the belief that by cutting vegetation along the streams, the evaporation losses would be reduced. In Feb. and March 1953 (two rainless months) daily water losses by evapotranspiration were measured on an experimental plot at Jonkershoek Forest Influences Research Station near Stellenbosch, before and after removal of vegetation. Data are shown in tables and regression curves, indicating that before removal the mean loss was 28.73 (thousand gallons a day) and after removal only 21.9 thousand gallons, and in the former case the increased loss was 1012 gallons/1°C and in the latter 522 gallons/day, with high degree of confidence. This is in spite of increased evaporation from the stream itself when vegetation is cut. (*Same item as* 9.4–178, April 1958, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Vegetation effects on evaporation 3. Stellenbosch, Cape Province, S. Africa.**—*M.R.*

10I–132 551.573(439.

Szesztay, Károly, **Tapasztalati eljárás a területi párolgás meghatározására.** [Empirical method of determining regional evaporation.] *Hungary. Vízgazdálkodási Tudományos Kutató Intézet Beszámoló . . . évi munkásságáról, 1954*, issued **1955.** p. 72–80. 4 figs., table, 7 refs., 3 eqs. Russian and English summaries p. 203. **DWB**—By using a graph for the evaluation of monthly evapotranspiration, developed originally by the Russian KUZIN, the hydrologic balance for the Zagyva River is computed. A method is suggested to determine the free porosity of water bearing layers and, finally, the daily water balance is computed and compared with precipitation, snow curve, temperature, relative humidity and duration of sunshine. (*Same item as* 9.10–223, Oct. 1958, *MAB.*) *Subject Headings:* **1. Evapotranspiration 2. Hydrologic cycle 3. Zagyva River, Hungary**—*A.A.*

10I–133 551.501.4:551.5

§†Täumer, Friedrich, **Eine Methode zur Bestimmung der Gebietsverdunstung auf meteorologischer Grundlage.** [A method of estimating areal evaporation on a meteorological basis.] *Leipzig. Karl-Marx-Universität. Institut für Agrarmeteorologie, Veröffentlichungen*, 1(1):1–71, 1958. 12 figs., 19 tables, 63 refs., 18 eqs. **DWB**—A formula is developed for determining evaporation from an area on the basis of aerological data showing the amount of convergence or divergence through the boundaries of that area. In addition to humidity transport the formula comprises humidity change and areal precipitation. The method is applied to the Spree basin by using data for 1938. Results

are compared with those obtained by KALWEIT (1954) by means of hydrological calculations, with considerable disagreement. The evaporation values obtained are also graphically correlated with atmospheric pressure, temperature, precipitation, synoptic situation, air mass type and fronts. (*Same item as* 8.5–135, May 1957, *MAB.*) *Subject Heading:* **1. Evaporation estimation.**—*G.T.*

10I–134 551.585:634.9

*Thornthwaite, Charles W. and Hare, F. Kenneth, **Climatic classification in forestry.** *Unasylva*, Rome, 9(2):51–59, June **1955.** 2 figs., 5 tables, 19 refs., map (in color). **DLC**—The authors discuss the need for climatic classification, in spite of the difficulties involved in classifying anything which does not have discrete groups or areas with sharp boundaries. The requests from the Asia-Pacific Forestry Commission, FAO and the Humid Tropics program of UNESCO for climatic charts of the world are examples of the demand. A good historical review of classifications is presented, starting with A. GRISEBACH'S (1866) world map of vegetation and considering KÖPPEN'S system as unsatisfactory for forestry uses and, finally, taking up the parameters of most importance (radiation, wind, turbulence, vapor lapse rate, soil and vegetation), the energy considerations of water deficiency, potential evapotranspiration and THORNTHWAITE'S system and application to forestry. A beautiful color chart of Africa shows moisture regions. (*Same item as* 8.10–65, Oct. 1957, *MAB.*) *Subject Headings:* **1. Climatic classifications 2. Evapotranspiration 3. Forest climatology charts.**—*M.R.*

10I–135 551.573:631.67:551.582.3(73)

Thornthwaite, C. Warren and Mather, J. R., **Climatology and irrigation scheduling.** *U. S. Weather Bureau, Weekly Weather and Crop Bulletin*, 42(26):6–8, June 27, **1955.** 3 figs., table. **DWB**—After defining potential evapotranspiration and explaining the method of its measurement, the authors point out the importance of its knowledge in irrigation work, as it provides information concerning the water needed by plants and thus the amount to be supplied by irrigation to supplement rainfall in case of soil-moisture deficiency. Limits can be set below which the soil moisture should not be allowed to fall for the particular crop and depth of root zone in question. By keeping a daily record of the evapotranspiration it is possible to know when the soil moisture depletion is reached, and to know how much and when to irrigate to bring the moisture level back to a safe value. A table showing the irrigation need during the past 7 years (1948–1954) in an area near Memphis, Tenn., on basis of a program of 1.5 in. of irrigation every time the moisture deficit reached 2.0 in., a map of U. S. showing the average annual potential evapotranspiration and 2 graphs, one showing the daily variation in soil-moisture deficit for 1954 and the second showing the average water balance for the same area, are included. (*Same item as* 7.8–188, Aug. 1956, *MAB.*) *Subject Headings:* **1. Potential evapotranspiration charts 2. Irrigation 3. United States.**—*A.M.P.*

10I–136 551.573:016

†Thornthwaite, C. W. and Mather, J. R., **The water balance.** *Drexel Institute of Technology. Laboratory of Climatology, Centerton, N. J., Publications in Climatology*, 8(1); Contract AF 19(604)-1306, Scientific Report, No. 1; Contract Nonr-1617(00), Task NR 389-101, Technical Report, No. 1, **1955.** 104 p. figs., tables, bibliog. p. 77–89. **DWB**—The studies made by the authors and their colleagues during the past decade on the problem of evapotranspiration and the water balance of land or crops are thoroughly reviewed in this monograph, which is largely made up of portions of previous reports. The first part deals with the subject of evapotranspiration and its complexities (instruments and method of calculation to compensate for inadequacies of present measurement techniques). The second part deals with applications (moisture deficit, moisture surplus, moisture storage, and moisture indices). Third part consists of a very extensive bibliography of articles from all parts of the world, on evapotranspiration. Much data and many charts are included. (*Same item as* 8.4–27, April 1957, *MAB.*) *Subject Headings:* **1. Potential evapotranspiration 2. Evapotranspiration bibliographies.**—*M.R.*

10I–137 551.579:631.67

†Thornthwaite, C. W. and Mather, J. R., **The water budget and its use in irrigation.** *U. S. Dept. of Agriculture, Yearbook, 1955*:346–358. pub. **1955.** figs., table, 29 refs. **DA, DWB**—A long and technical discussion of evapotranspiration and related problems of drought and irrigation. Sources of energy (sun and earth), albedo and moisture effects on energy absorbed; measurement by evapotranspirometers or by calculation of moisture budget; water needs in various parts of the country and various years or seasons; and retention of moisture are discussed. Annual march of soil moisture at 0–40″ in relation to field capacity at Cashocton, Ohio (1944), and in various layers at College Park, Md. (1942), irrigation schedules at Seabrook, N. J., for different crops (1954), relation of precipitation to potential evapotranspiration at Berkley and Seabrook throughout the year and, finally, water deficiency each year from 1920–44 at 4 representative stations in the East and Midwest, showing that Charles City, Iowa, with 31″ a year has only 2.7″ deficiency, whereas Auburn, Ala. with 50″ a year has a 6.7″ deficiency because of seasonal inefficiency of rainfall (an

excess of 18.4″ occurs in winter) are shown graphically and discussed. *Subject Headings:* **1. Hydrologic cycle 2. Irrigation requirements 3. Moisture deficiency.**—*M.R.*

10I–138 551.573(51)

†Tschu, Kang-Kun and Yang, Jen-Chang, **A study of the evaporation distribution in China.** *Acta Meteorologica Sinica*, Peking, 26(1/2):1–23, **1955.** 8 figs., 13 charts, 25 refs. In Chinese; English summary p. 23. **DLC** (Orientalia)—Various methods of computing evaporation (PENMAN, THORNTHWAITE, HAUDE, ALBRECHT, POPOV, WILD, PICHE) are described and compared, and the Penman method adopted for calculating the evaporation for China. Values for a number of stations are given in tables and graphs, and monthly and annual charts (with isarithms) presented for the whole country east of the 100th meridian. Lines of future investigation and applications to national problems are considered. A climatic classification based on evaporation is demonstrated. (*Same item as* 9.9–224, Sept. 1958, *MAB.*) *Subject Headings:* **1. Evaporation in China 2. Evaporation charts 3. Penman's method of evaporation computation 4. China.**—*M.R.* (*Partly from authors' abstract*).

10I–139 551.573:061.3

Tsuberbiller, E. A., **Soveshchanie po voprosu ob isparenii s poleĭ, zaniatykh sel'skokhoziaĭstvennymi kul'turami.** [Conference on the evaporation from fields under cultivation.] *Meteorologiia i Gidrologiia*, Leningrad, No. 6:67, Nov./Dec. **1955. DWB, DLC**—This conference, which was held by the department of geophysics of the Central Asiatic State University (Tashkent), came to the conclusion that SKVORTSEV's method is suitable for determining the total evaporation from both irrigated and non-irrigated fields, and rated highly the use of SKVORTSEV's evaporimetric coefficient for establishing sprinkling intervals and determine growing conditions for crops. (*Same item as* 8.11–208, Nov. 1957, *MAB.*) *Subject Headings:* **1. Evaporation from plant cover 2. Irrigation calculations 3. Conferences 4. U.S.S.R.**—*I.L.D.*

10I–140 551.5:63:551.573:551.579.5

Uhlig, Siegfried, **Netzmässige agrarmeteorologische Beobachtungen.** [Agrometeorological network observations.] *Germany. Deutscher Wetterdienst, Mitteilungen*, 2(14):159–167, **1955.** 5 figs. **DWB**—Observations of agrometeorological values are carried out by the several climatological services. These include measurements of soil moisture, soil temperature, evaporation of soil moisture and of radiation. The station network for soil moisture measurement and the economic activities interested in such data (highway construction, agriculture and water economy), the technique of measuring soil moisture and the procedure for carrying out the measurements of the other elements are discussed. A map showing the locations of soil moisture observation in Western Germany, graphs showing the annual variation of soil moisture at a depth of 10–30 cm in per cent of maximum obtainable soil moisture content for various localities, a map showing the location of Piche-evaporimeter stations, a diagram of its Piche tube under a radiation shield and a graph showing mean monthly totals of potential evapotranspiration for stations in different climatic zones as measured by PENMAN, THORNTHWAITE and UHLIG are presented. (*Same item as* 9.10–68, Oct. 1958, *MAB.*) *Subject Headings:* **1. Agrometeorological services 2. Soil moisture measurements 3. Potential evapotranspiration 4. Evaporation 5. West Germany.**—*I.L.D.*

10I–141 551.573:551.579.5:581.1

Veihmeyer, F. J. and Hendrickson, A. H., **Does transpiration decrease as the soil moisture decreases?** *American Geophysical Union, Transactions*, 36(3):425–428, June **1955.** 5 figs. **Discussion.** *Ibid.*, p. 429–448. 11 figs., 7 tables, refs. p. 447–448. **DWB**—This paper gives results obtained from a prune tree and from a pine tree grown in a suspended tank that permitted the obtaining of a continuous record of moisture loss from the soil. Additional results from field trials with pine, oak, and manzanita on a watershed area and from apricot and prune trees under cultivation show that the rate of moisture extraction from the soil is not influenced by the water in the soil so long as the latter is above the permanent wilting percentage. (*Same item as* 7.2–235, Feb. 1956, *MAB.*) *Subject Headings:* **1. Transpiration-soil moisture relationships 2. Transpiration of trees 3. Soil moisture.**—*Authors' abstract.*

PART III. REVIEWS, TRANSLATIONS, RECENT MONOGRAPHS, AND ANALYTICS FROM SERIALS AND COLLECTED WORKS

Note: Material listed in these sections will not be included in the monthly indexes until abstracted. The item number is mentioned for those titles which have been abstracted in previous issues of **Meteorological Abstracts and Bibliography.**

A. REVIEWS OF IMPORTANT METEOROLOGICAL MATERIAL

mbartsumian, V. A. (ed.): **Theoretical astrophysics.** Translation from the Russian by J. B. Sykes. London, Pergamon Press, 1958. 645 p. Price $22.50. Review by Cecilia Payne-Gaposchkin in *Physics Today*, N. Y., 12(5):56, May 1959. (*For abstract on this title, see* 9.10–9, Oct. 1958, *MAB*)

merican Petroleum Institute, N. Y.: **Handbook of degree-day data for the U. S., prepared by Dept. of Technical Services.** N. Y., Pub. by Institute, 1958. 2 vol. 210 and 188 p. Price $7.00 each. Review in *Air Conditioning Heating and Ventilating*, 56(5):97, May 1959. (*See* 9.11–34, Nov. 1958, *MAB*)

rctic Institute of North America: **Arctic bibliography,** Vol. 6–7, pub. 1956. Prepared for and in cooperation with the Dept. of Defense. Marie Tremaine, ed. Vol. 6, 1208 p. Vol. 7, 1071 p. Price $4.50 and $4.25, from Govt. Printing Office, Wash., D. C. Review by Hans P. Fuchs in *Science*, Wash., D. C., 129(3357):1218, May 1, 1959.

harlesworth, J. K.: **Quaternary era, with special reference to its glaciation.** London, Edward Arnold, 1957. 2 vol. (1700 p.) Review in *Journal of Glaciology*, 3(25):434–435, March 1959. (*See* 9.1–11, Jan. 1958, *MAB*)

efant, A. and Defant, Fr.: **Physikalische Dynamik der Atmosphäre** [Physical dynamics of the atmosphere]. Frankfurt a.M., Akademische Verlagsgesellschaft, 1958. 527 p. Price DM 60,–. Review by H. Koschmieder in *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 32(1/2):121–122, 1959. (*See* 10.5–8, May 1959, *MAB*)

ett, Walter: **Der atmosphärische Staub** [Atmospheric dust]. Berlin, VEB Deutscher Verlag d. Wissenschaften, 1958. 309 p. figs. Review by Kurt Gräfe in *Annalen der Meteorologie*, Hamburg, 8(7/8):234, 1958. Review by H. Koschmieder in *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 31 (3/4):277–278, 1959. (*See* 10.5–11, May 1959, *MAB*)

oitzik, L. and Hinzpeter, H.: **Sonnenstrahlung und Luftbrübung** [Solar radiation and air pollution]. Leipzig, Geest & Portig, 1958. 308 p. figs., diagrs. Price DM 43. Review by O. Czepa in *Beiträge zur Geophysik*, Leipzig, 68(3):188–189, 1959. Review by H. Koschmieder in *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 32(1/2):125–126, 1959.

nternational Geophysical Year, 1957/1958: **Annals, Vol. 6, Manual on rockets and satellites.** Ed. by L. V. Berkner. Pub. London, Pergamon Press, 1958. 508 p. Price $25.00. Review by F. Steinhauser in *Archiv f. Meteorologie, Geophysik und Bioklimatologie, Ser. A*, Vienna, 11(1): 147—148, 1959.

raël, H.: **Atmosphärische Elektrizität, Teil I, Grundlagen, Leitfähigkeit, Ionen** [Atmospheric electricity, Vol. 1, Fundamentals, conductivity, ions]. Leipzig, Geest and Portig, 1957. 370 p. illus. (*Probleme der Kosmischen Physik*, Vol. 29.) Review by T. W. Wormell in *Meteorological Magazine, London*, 88(1,042):119–121, April 1959. (*See* 9.3–4, March 1958, *MAB*)

aiser, Frances E. (*ed.*): **Translators and translations: services and sources.** Issued N. Y., Special Libraries Association, 1959. 60 p. Price $2.50. Review by Charles M. Gottschalk in *Science*, Wash., D. C., 130(3369):214–215, July 24, 1959.

ilinski, E.v: **Lehrbuch der Luftelektrizität** [Textbook on atmospheric electricity]. Leipzig, Geest & Portig, 1958. 140 p. figs. Price, DM 17,–. Review by H. Israël in *Beiträge zur Geophysik*, Leipzig, 68(1):64, 1959. (*See* 10.2–9, Feb. 1959, *MAB*)

olmogorov, A. N.; Obuchov, A. M.; Iaglom, A. M. and Monin, A. S.: **Sammelband zur statistichen Theorie der Turbulenz** [Collected works on the statistical theory of turbulence]. (Trans. from original Russian by N. Goering.) Berlin, Akademie Verlag, 1958. 228 p. figs., tables. Price DM 25,50. Review by G. Skeib in *Zeitschrift f. Meteorologie*, Berlin, 12(9/10):316–317, Sept./Oct. 1958. Review by F. Wippermann in *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 32(1/2):121, 1959.

B. TRANSLATIONS AND RECENT MONOGRAPHS

TRANSLATIONS

Belousov, S. L.: **Numerical prediction of the pressure pattern at different levels.** (Transl. of origina Russian, **O predvychislenii davleniia na raznykh urovniakh atmosfery,** in *Meteorologiia Gidrologiia*, Leningrad, No. 9:15–19, 1957. figs., refs., eqs.) Transl. by A. Nurklik issued a *Canada. Meteorological Branch, Meteorological Translations*, No. 1:1–6, Jan. 1959.

Berg, Eduard: **Phase relations in the diffraction region with stratified troposphere.** (Transl. o original German, **Phasenverhältnisse im Beugungsschatten in geschichteter Troposphäre,** i *Archiv der Elektrischen Übertragung*, Stuttgart, 11(9):366–378, Sept. 1957. figs., refs., eqs. Transl. by A. P. Barsis issued as *U. S. National Bureau of Standards, NBS Translation* No. 556 July 30, 1958. 37 p. figs., etc. Available DWB (M10.52 B493ph)

Blagonravov, A. A.: **Study of the upper strata of the atmosphere by means of high altitude rockets** (Transl. of original Russian **Issledovanie verkhnikh sloev atmosfery pri pomoshchi vysotnyk raket,** in *Akademiia Nauk SSSR, Vestnik*, 27(6):25–32, June 1957. figs., tables.) Transl. b E. R. Hope issued as *National Research Council of Canada, NRC*-C2456. Available DW (M07.362 B633st) (*For abstract on original Russian, see* 10.6–89, June 1959, *MAB*)

Demin, I. D.: **Influence of the resolution of a radar station on the accuracy of determination of ic concentration.** (Transl. of original Russian, **Vliianie razreshaiushcheĭ sposobnosti radi lokatsionnoĭ stantsii na tochnost' otsenki splochennosti l'dov,** in *Problemy Arktiki*, Leningra No. 3:61–68, 1958.) Transl. by Valda Dreimanis issued by American Meteorological Societ under Contract AF 19(604)-1936, Aug. 1958. 12 p.

Gal'perin, Iu. I.: **Observations of hydrogen emission in aurorae.** (Transl. of original Russia **Nabliudeniia izlucheniia vodoroda v poliarnykh siianiiakh,** in *Astronomicheskiĭ Zhurnal*, Moscow 34(1):131–134, Jan./Feb. 1957. figs., tables, refs.) Transl. issued in *Soviet Astronomy, AJ* New York, 1(1):133–137, issued 1958. figs., etc.

Schlichting, Hermann: **Boundary layer theory.** (Transl. of original German, **Grenzschicht-Theori** issued Karlsruhe, G. Braun, 1951. 483 p. numerous figs., tables, refs., bibliog.) Trans issued by McGraw-Hill, N. Y., 1955. 535 p. Price $15.00. Available for reference DL (TL574.B6S283) (*See* 4.1–8, Jan. 1953, *MAB*)

RECENT MONOGRAPHS

Barnes, H.: **Oceanography and marine biology: a book of techniques.** London, Allen & Unwi 1958. 220 p. figs. Price 35 sh.

Cole, Monica M.: **Land use in the Transvaal Lowveld.** London, Geographical Publications, Lt 1957. DLC (GB365.T7C6)

Condon, E. U. and Odishaw, Hugh (eds.): **Handbook of physics.** N. Y., McGraw-Hill, 1958. 15 p. illus. Price $25.00. DLC (QC21.C7)

Flint, Richard Foster: **Glacial and pleistocene geology.** N. Y., John Wiley, 1957. 533 p. plat figs. Price 100 sh. "Based on his **Glacial Geology and the Pleistocene epoch,** issued 1947 DLC (QE696.F54)

Gavrilov, V.: **Svetovye iavleniia v atmosfere** [Light phenomena in the atmosphere]. Mosco 1952. 91 p. illus. DLC (QC975.G3)

Hamilton, Richard A. (ed.): **Venture to the Arctic.** London, Penguin Books, 1958. 283 p. DI (G743.H35)

Heiskanen, W. A. and Vening Meinesz, F. A.: **Earth and its gravity field.** N. Y., McGraw-H 1958. 470 p. figs. DLC (QC815.H4)

Huk, M. I.; Polovko, I. K. and Prikhot'ko, L. F.: **Klimat Ukrains'koĭ RSR** [Climate of the Ukrain Kiev, Radians'ka Shkola, 1958. 69 p. DLC (QC989.R5U45)

Knoch, Karl and Schulze, A.: **Niederschlag, Temperatur und Schwüle in Afrika** [Precipitati temperature and sultriness in Africa]. Hamburg, Falk-Verlag, 1956. p. 151–156. Ma 72–77. DLC (G2446.C8K6 1956)

Kucherov, N. I.: **Noveĭshie dannye o zhizni na Marse** [Newest data on life on Mars]. Izd- Znanie, 1959. 44 p. Price 85 k.

Magill, P. L.; Holden, F. R. and Ackley, Ch. (eds.): **Air pollution handbook.** N. Y., McGraw-H 1956. 674 p. DLC (TD883.M35)

Orr, Clyde: **Between earth and space.** N. Y., Macmillan, 1959. 233 p. illus. DLC (QC863.0

Schneider, Hermann and Schneider, Nina: **Let's find out about the weather.** N. Y., Grosset Dunlap, 1956. 23 p. DLC (QC863.S36)

Strohmeyer, Otto H.: **Besonnung und Belichtung** [Insolation and illumination]. Hamburg, Hammonia-Verlag, 1955. 43 plates (in portfolio). 32×44 cm. DLC (QC911.S8)

U. S. Weather Bureau: **Climatic guide for New York City, New York and nearby areas.** *U. S. Weather Bureau, Climatography of the U. S.*, No. 40-26, 1959. DLC

C. METEOROLOGICAL ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS

Acta Geophysica Polonica, Warsaw, Vol. 7, No. 1, 1959

Witkowski, Józef: **Latitude Station of the Polish Academy of Sciences at Borowiec,** p. 3–8

Dobrzycki, Jerzy: **Observations of artificial earth satellites made at the Latitude Station of the Polish Academy of Sciences at Borowiec,** p. 9–11

Stenz, Edward: **Niektóre dane o promieniowaniu słonecznym w Karpatach, Sudetach i ich przedgórzu,** [Some data on insolation in the Carpathians, Sudetes and their foothills], p. 12–24

Parczewski, Władysław: **Atmospheric situations causing sudden swelling of small rills,** p. 25–33

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